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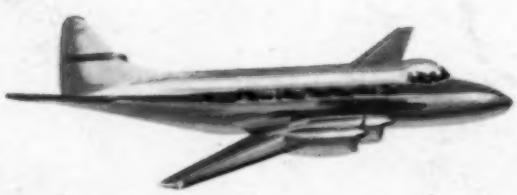

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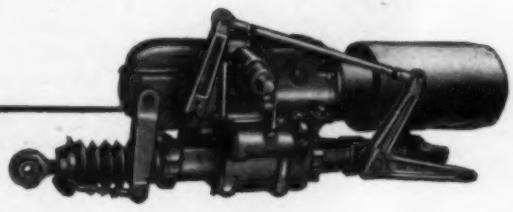

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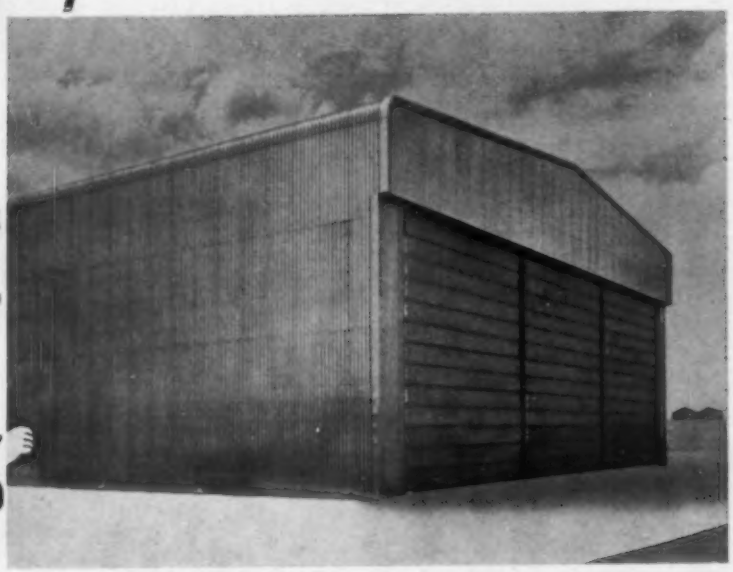

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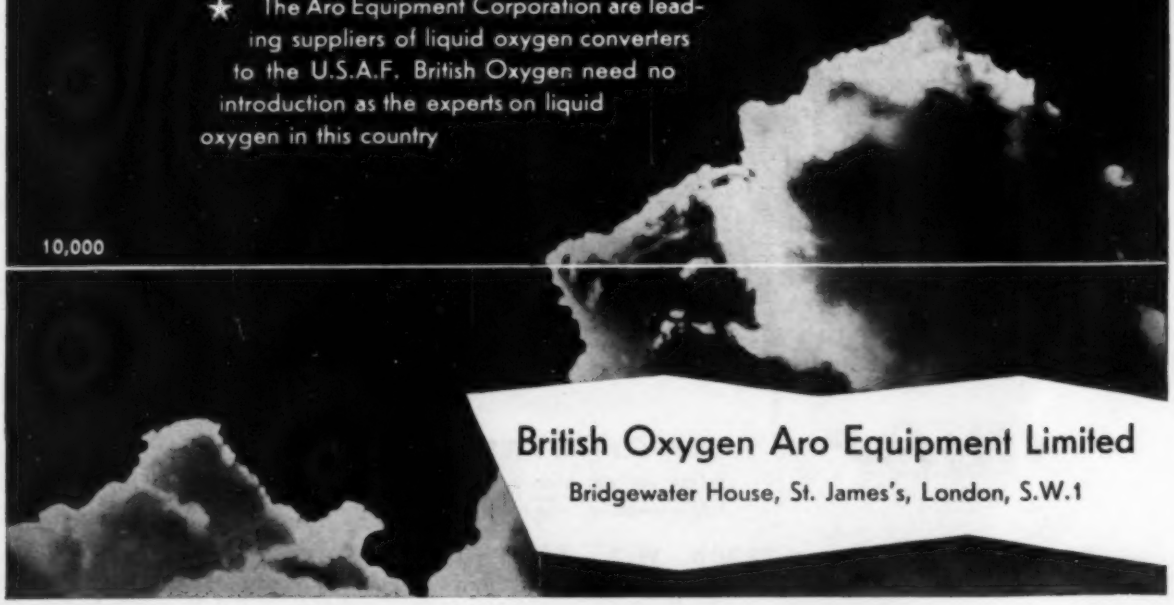

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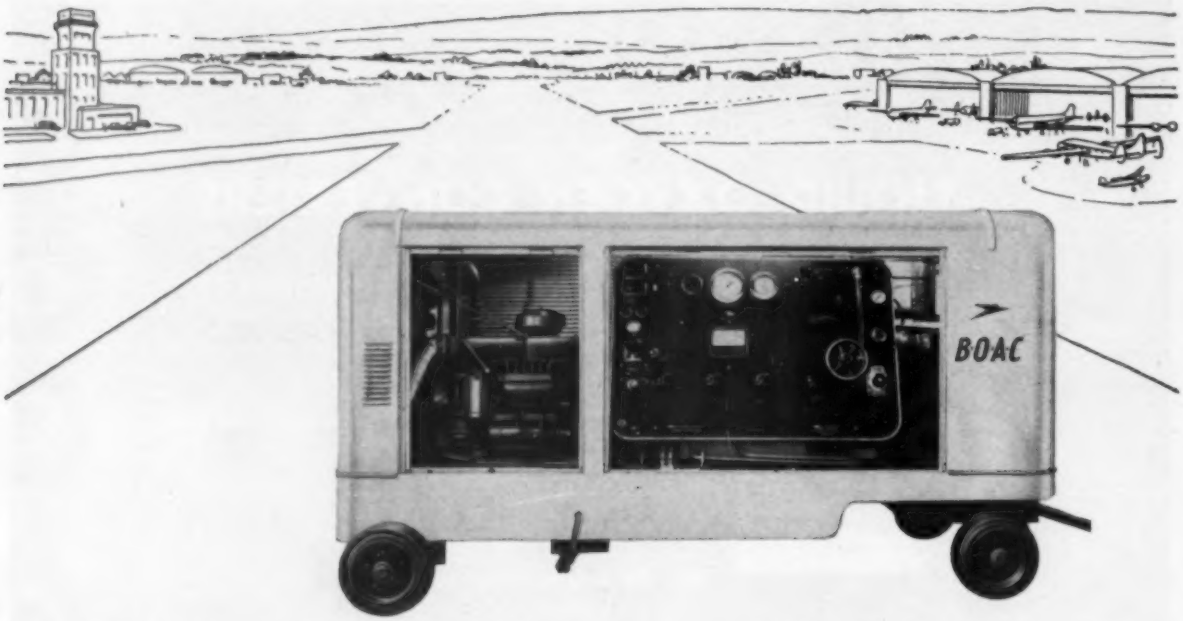

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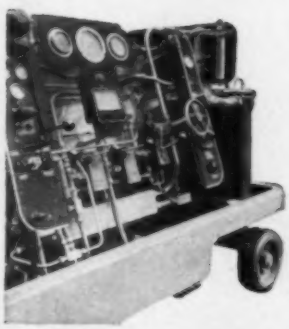

Three-quarter view of control panel with centre section removed for easy access to instruments.

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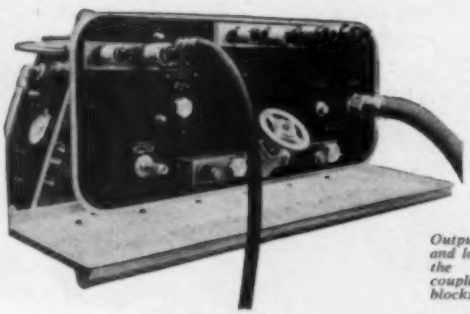

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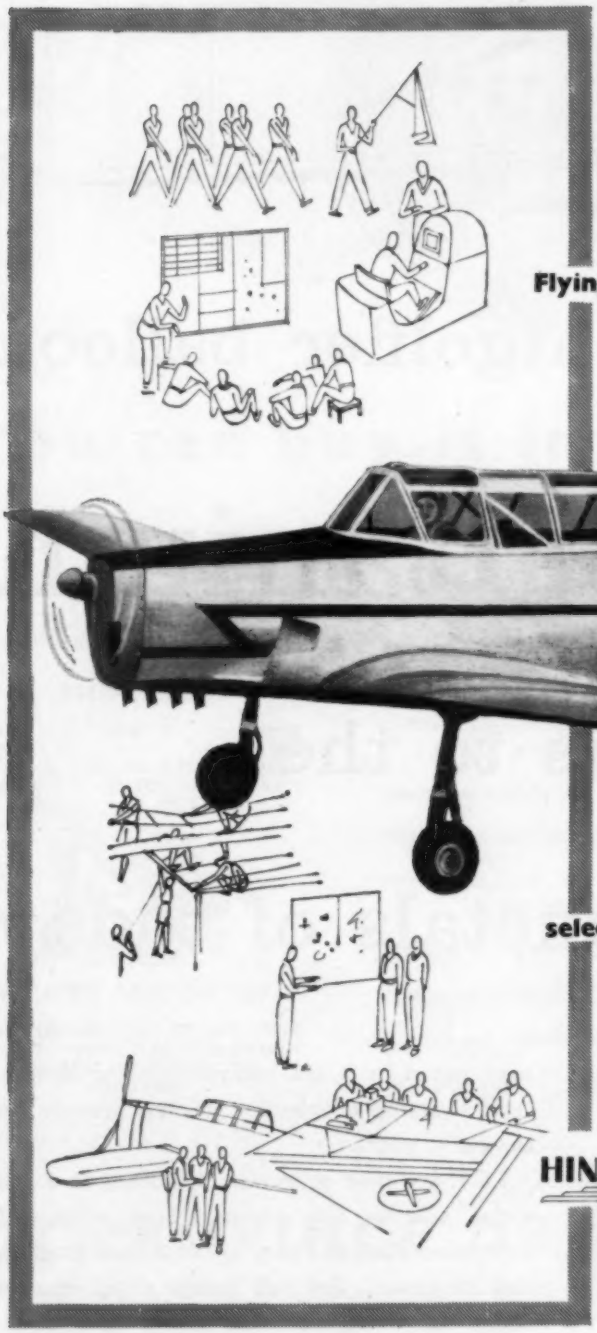

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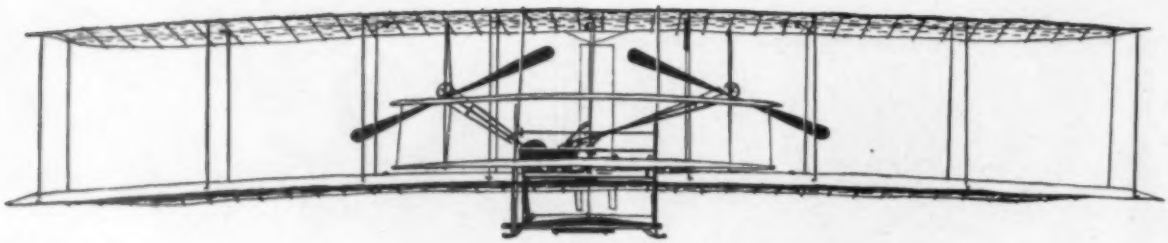

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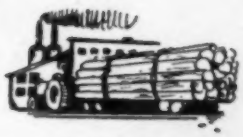

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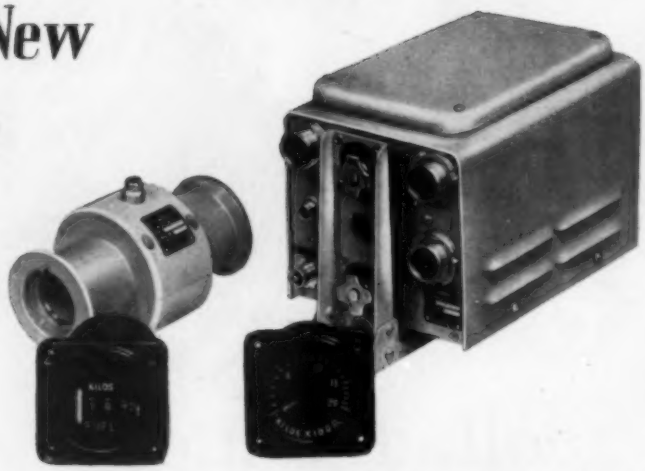

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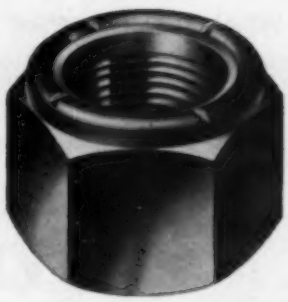

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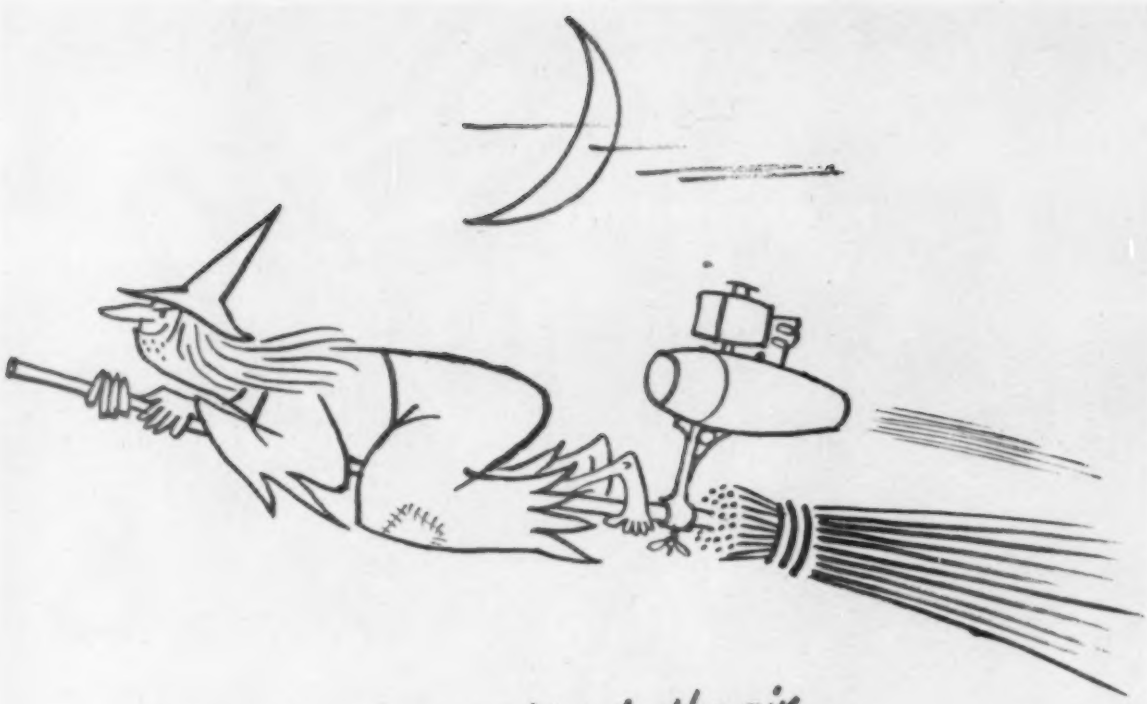

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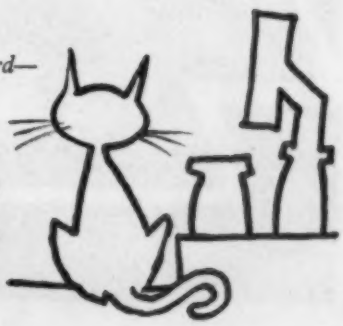

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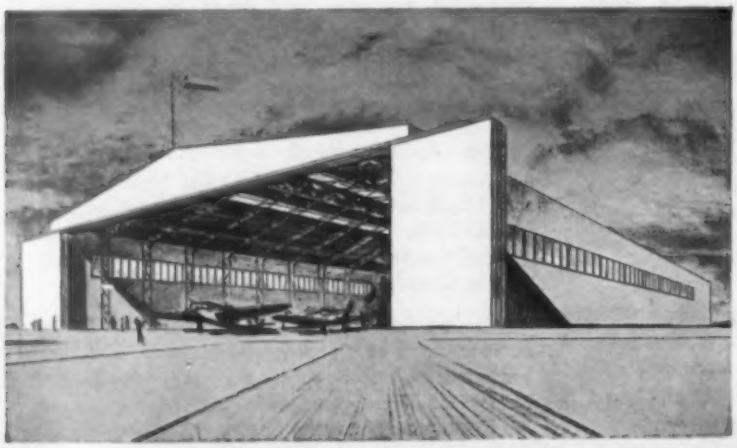

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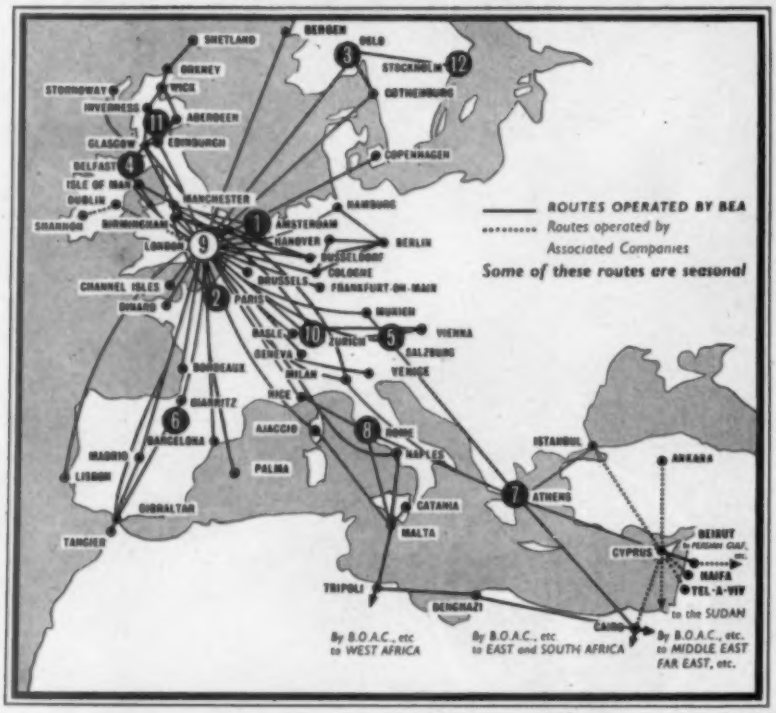

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FLIGHT and AIRCRAFT ENGINEER

No 2483 Vol 70 FRIDAY 24 AUGUST 1956

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Commonwealth Perspective

THE British Commonwealth is a state of mind. However unfashionable a concept it may appear to some people—particularly, it seems, to some who have rarely if at all left the shores of this country—it is a live and vigorous family. This issue of *Flight* is the third to be devoted to some aspects of the aviation activities of this group, and in particular to the work of the various companies which make up the Commonwealth aircraft industry.

What is shown in the progress reports for the year just completed? Canada displays three new projects, variously advanced. Already complete and about to enter service with the Royal Canadian Navy are Canadian-built Grumman CS2Fs, first products of a widespread co-operative programme, with de Havilland as prime contractors. Progressing steadily in the production shops at Canadair is the first CL-28 maritime reconnaissance version of the Britannia; while a little further away is the new all-Canadian delta, Avro's Mach Two CF-105.

Continued production of the types being built last year is reported from Australia, where the aircraft companies are hampered by Government delay in selecting the aircraft types to follow the Avon-Sabre and Canberra in service with the R.A.A.F. A decision was overdue at this time last year; the difficulties of planning for production can only be aggravated by such a lack of a long-term programme.

New Zealand, home of aerial farming, has achieved a status in this field directly comparable to that of Canada in aerial surveying of all types, and forthcoming developments on the manufacturing side are foreshadowed by the appearance of new British agricultural aircraft. Meanwhile, India's own HT-2 trainer is now being shown to a wider world market.

One of the most heartening impressions absorbed by a visitor from the United Kingdom to the factories of the Commonwealth countries is the combination of a fresh approach to new problems and an almost embarrassing concern for the success of the industry back home. It is an impression at once reassuring and humbling.

The Mirror of the Sea

IT may be an impertinence to appropriate to this brief topical note the title of Joseph Conrad's masterful collection of salt-water reminiscences; but the cause is one that Conrad himself would not have despised, namely, the promotion of safety and efficiency at sea. In any case, the title was coveted firstly for its literal suitability, for our main concern is the British mirror-landing aid for carrier-based pilots. This device, shown on page 282 in use by the U.S. Navy aboard the British carrier *H.M.S. Eagle*, is one of two invaluable technical contributions made by our own Admiralty to the Allied cause (the second, of course, being the steam catapult, which alone enables the atom-bombers of the U.S. Navy to achieve their full potential).

In earlier years, it is true, we ourselves have been much indebted to the American Navy; but the mirror aid, now dubbed OGPI (it renders a no-longer-secret service as the "optical glide-path indicator"), together with Britain's titanic steam sling-shot, go very far towards squaring the account.

Not the least valuable result of such standardization is that the aircraft of two great Services can now operate without difficulty and to mutual advantage from each other's carriers, and from this association a breezy rivalry has arisen.

But though Britain has lately been paying her way in terms of technical contribution, it is often felt (and doubtless sometimes with justification) that a marked disparity persists in the technical qualities of British and American naval aircraft. In this matter, however, we appear to have little cause to hang our heads, for it is credibly reported that one of our fighters—the familiar straight-wing Hawker Sea Hawk—has proved, in several "operational situations," its definite superiority over swept-wing American machines of later design.

The British sea dog has not yet had his day.

FROM ALL QUARTERS

Vulcans at Waddington

SOME half-dozen Avro Vulcan B.1s have now been delivered to the new conversion unit at R.A.F. Station Waddington, where all Vulcan crews are being trained.

A small number of Vulcans will be kept there for training purposes and subsequent machines will be passed on to newly formed squadrons as the crews are ready to take them over.

Masefield on Jet v. Turboprop

ONE of the questions which Mr. Peter Masefield, managing director of Bristol Aircraft, put before the National Turbine-Powered Air Transportation Meeting at San Diego on August 15 (see last week's *Flight*) was: "Is there a place for the turboprop long-term—long-range, medium-haul, or what?" Answering it, he said he thought three points counted: first, the turboprop would remain the most economic means of carrying passengers by air. Second, turboprop speeds would be increased to better than 500 m.p.h.: the Russians were already flying turboprops at up to 525 m.p.h. Third, the turboprop would have more flexibility in performance—in its effect on take-off distance, on operating height, and on sector length. "With these attributes," he said, "I believe that the turboprop will remain with us in its advanced form as far forward as we can see."

We hope to include further extracts from Mr. Masefield's address next week.

L. G. Frise Joins Blackburn

EARLIER this week it was announced by Blackburn and General Aircraft, Ltd., that Mr. L. G. Frise, B.Sc., F.R.Ae.S., A.F.I.A.S., has joined the company. He has been appointed to fill the newly created post of director of special projects. Mr. Frise will be based in London and may be reached either through the Blackburn drawing office at 63, Old Brompton Road, South Kensington, or through the company's London office at 43, Berkeley Square, W.1.

Before joining Blackburn and General Aircraft, Mr. Frise was technical director of Hunting Percival Aircraft, Ltd., at Luton Airport, Beds, where he was closely engaged in several of that company's varied programmes. For most of his career, however, Mr. Frise was with the Bristol Aeroplane Co. (as it then was), for whom he was a principal designer and later chief designer over a period of 32 years. Among other things he is famed for the aileron which bears his name.

Yet Another Bell 47

KNOWN as the Ranger, the Bell Model 47J has been evolved as the latest commercial addition to the popular single-rotor helicopter family. Powered by a 260-h.p. Lycoming, the 47J will carry a useful load of 1,017 lb and is normally furnished for pilot and three passengers, the latter being on a wide bench seat at the rear. Several alternative versions are offered with very full equipment for specialist roles.

M.o.S. and Air Ministry Appointments

IT was announced last weekend that the Ministry of Supply has appointed Mr. Handel Davies to be Deputy Director-General of Aircraft Research and Development (Future Systems). Mr. Davies has been Scientific Adviser to the Air Ministry since February 1955.

Mr. Handel Davies.

Mr. Scott-Hall.

He is succeeded in that post by Mr. Stewart Scott-Hall, and Mr. Scott-Hall's present post as head of the M.o.S. staff at the British Joint Services Mission in Washington will be taken over by Mr. S. F. Follett. The appointments take effect in October.

Farnborough Fare

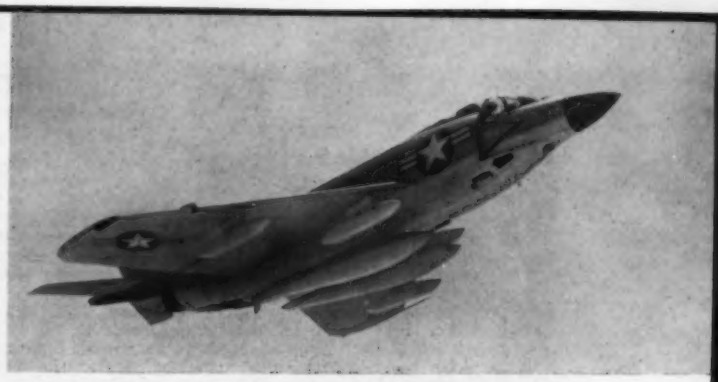
PIQUANCY is added to the days preceding each successive S.B.A.C. Display by the inevitable uncertainties of participation. This year is no exception, although the following preview sets forth the general pattern. Newcomers include versions of the Hawker Hunter and Supermarine Swift carrying Fairey Fireflash guided missiles; the Scorpion-Canberra; Supermarine N.113; and reverse-thrust Hunter.

The Display will be divided into five phases, three of which will feature groups of several aircraft in the air simultaneously, for periods varying from four to seven minutes. This year (officially for the first time) selected guests will be enabled, on the "trade" days, to fly in certain aircraft.

The opening item will be a trooping demonstration: a hundred troops will board a Blackburn Beverley, which will immediately take off, and, on landing again, will demonstrate the speed with which the troops can be disembarked and get into action. The next three aircraft to take the air will be flying test-beds: the Short Sperrin fitted with two de Havilland Gyrons; a Bristol Britannia fitted with two Proteus 705s, one Proteus 755 and one Orion; and an English Electric Canberra with the new Napier Scorpion rocket engine. Following up will come an Avro Lincoln fitted with a Rolls-Royce Tyne, and a Canberra with an Avon RA.29 (this is the Avon for the Comet 4s and 4As); and allocated to the first group also will be one of the new Fairey Gannet A.S.4 anti-submarine aircraft and an Avro Shackleton M.R.3 long-range maritime-reconnaissance machine. Also in this first group will be a Hawker Hunter fitted with a reverse-thrust device.

The second group will feature single- and two-seater military and research aircraft, ranging from the Auster Aiglet and Hunting Percival Jet Provost trainers to the Folland Gnat light fighter and various marks of Gloster Javelins and Hawker Hunters. The Hunters, we learn, will

***NUCLEAR TEST-BED:** This Convair NB-36H is the world's first aircraft to fly with an atomic reactor, developed by Convair. On test flights the aircraft is not, however, actually powered by the "hot" reactor; nor is the latter turned on until the aircraft is high over an unpopulated area. The reactor is cooled by air scoops on the aft fuselage.*



***QUEER DEVIL:** This McDonnell F3H-2N Demon fighter of the U.S. Navy is carrying four packages of air-to-air rocket projectiles and two external fuel tanks of unfamiliar outline.*

include the Two-Seater and versions with external stores (one of them carrying two Fairey Fireflash air-to-air guided missiles). Two naval fighters—the de Havilland D.H.110 and Supermarine N.113—will be followed by the supersonic English Electric P.1, which will not, however, land—"for security reasons." This group will be completed by the Fairey F.D.2, holder of the world's speed record. The second F.D.2 may also be present.

Three V-bombers—an Avro Vulcan, Handley Page Victor and Vickers-Armstrongs Valiant—will head the third group. The Valiant will be rocket-assisted on take-off by two de Havilland Sprites. Also included will be a Vickers Viscount 802 and a Bristol Britannia 301. Following up, to complete this third group, will come a de Havilland Heron, a Scottish Aviation Prestwick Pioneer and—in strange company this—a Hawker Sea Hawk.

The next—helicopter—group will be made up of the Bristol 173 and Sycamore, the Saunders-Roe Skeeter, two Westland Widgeons (one a passenger machine, the second an ambulance), a Whirlwind and the Fairey Ultra-Light.

The fifth and last group will be made up of a Bristol Britannia, a Handley Page Herald, a Scottish Aviation Twin Pioneer and the new Hunting Percival President—civil version of the Pembroke.

Statically displayed aircraft will include a Fairey Gannet A.S.4, with specimen armament loads disposed around it, and a Fairey Firefly U.9 radio-controlled target aircraft with a Fireflash missile on a trolley alongside. In addition to a Swift F.R.5 fighter/reconnaissance machine there will be a Swift Mk 7—a version of uncommon interest, having a slightly increased fuselage length, greater wing span and carrying four Fairey Fireflash guided weapons beneath its wings. A Bristol Britannia 100 will be shown fully furnished.

We are already receiving a number of inquiries from readers for information on the organization for spectators at the Show. To summarize briefly: the three "public" days are September 7-9, and admission prices are as follows: Friday, £1 (children under 14, 10s); Saturday and Sunday, 5s (children 2s 6d). Car parking is £1 on the Friday. On the Saturday and Sunday, the charge of £1 10s per car includes any number of occupants up to six. Motor cycle parking is 2s 6d. Advance tickets *for Friday only* are obtainable from Autoparks, Ltd., 1-31 Maclise Road, London, W.14. The gates open at 10 a.m. on each day and the flying display starts at 3 p.m. The airfield is easily reached by train and road; a map, and further details, will be published in our next issue.

More Vertols for France

AN order for 50 additional Vertol H-21 helicopters has been placed by the French Ministry of National Defence and the Armed Forces, following extensive test of such machines in operations under arduous conditions in Algeria. A previous order for 50 was placed last March; first deliveries against this contract were made in June and the H-21's behaviour in Algeria is reported to have been most satisfactory. Their maintenance and repair is handled by S.N.C.A.S.O.

New Gloster Division

THAT devices originally developed by Gloster Aircraft to meet specialized aircraft or guided-weapon requirements are likely to find ready sales in very much wider markets is the chief fact underlying an announcement made this week by the company. Such items as hot-air valves, electro-hydraulic servos and various units used in pressurized liquid or gas systems are to be developed for a multitude of industrial and domestic purposes.

For this purpose Gloster have formed a Technical Developments Division, which will occupy a 35,000 sq ft research facility now being built adjacent to the company's main aircraft plant. Very complete equipment has been installed for many kinds of basic engineering experimentation and development and the division will also, of course, have access to the great fund of knowledge of Gloster Aircraft proper and the other Hawker Siddeley members. The division is headed by Mr. Eric W. Absolon, Gloster chief of engineering research; and Mr. R. F. G. Carse, sales manager, has been appointed to conduct full-time market research and sales promotion for the new offshoot.

Private Owner Heavily Fined

AT Lymington, Hants, on August 14, a private owner, Mr. Norman Jones, of Claygate, Surrey, was fined £200—the maximum—for landing his aircraft (a Tiger Moth) at Beaulieu R.A.F. airfield, Hants, without permission. He was also ordered to pay £30 2s 2d costs. The chairman of the magistrates, Mr. P. M. Gardner, said the defendant (who was not in court nor represented, but who sent a letter) appeared to have landed in a deliberate manner on a Government aerodrome where landing was prohibited. Mr. P. M. Stephenson, prosecuting, said that it was an offence to land at any such aerodrome which had not been notified as being made available for public use, unless the pilot was flying a Government aeroplane or was in trouble.

Edwin Snelling, of the police at the airfield, said he saw the defendant's aircraft land at 1015 hr on March 17. The pilot was taken to the guardroom and there told him: "Yes, it was a normal landing. I thought the airfield was disused." Sgt. John Holliday, R.A.F., said that it was pointed out to Mr. Jones that all the runways had 60ft crosses on them to indicate that no landings were allowed unless in emergency.

An appeal is being lodged.

"FLIGHT" NEXT WEEK

THE next issue of *Flight*, dated Friday, August 31, will be the annual Britain's Aircraft Industry Number, and it will be an outstanding one both in size and in content. All the current British aircraft and engines will be reviewed and illustrated, and new equipment described. There will, in addition, be a quick-reference directory to the ancillary industry, making the whole publication a particularly valuable work of reference. A guide to the S.B.A.C. Show will be included. Price of this issue will be 2s. 6d.; demand is heavy, and orders should be placed in advance.

The two succeeding numbers will be the Farnborough Report (September 7), and Farnborough Review (September 14).

***CHASSEURS:** One of the first photographs showing Hawker Hunter intercepters in service with the Royal Belgian Air Force.*

FROM ALL QUARTERS. . .

Col. D. C. Schilling

WE regret to record the death in a car accident of Colonel David C. Schilling, U.S.A.F. "Dave" Schilling was one of the great fighter pilots of World War 2 in the European theatre and was awarded American, British and French decorations. He shot down 23 enemy aircraft. After the war he did much of the pioneer long-distance work with Flight Refuelling, Ltd., and during 1950 made the first non-stop trans-Atlantic jet fighter crossing in an F-84 from Manston, Kent, to Limestone, Maine, with the aid of probe and drogue air refuelling. In 1952 he led a large formation of jet fighters on a flight-refuelled non-stop crossing of the Pacific to Japan. At the time of his death he was Inspector-General of the Strategic Air Command's Seventh Air Division.

Soviet North-East Bases

ACCORDING to United States Air Force intelligence officers, there has recently been substantial reinforcement of Russian military air strength in the region of the U.S.S.R. nearest to the North American continent. Apparently a large part of Russia's increased output of fighters and bombers is sent to bases in the far north-east region of the Soviet Union.

General Nathan Twining, U.S.A.F. Chief of Staff, said last week he was disturbed by the mass production of military aircraft in the U.S.S.R., commenting that Russia had "thousands more jet combat planes in operational units than the U.S. Air Force and Navy combined."

Senior officers of the Alaskan Air Command believe that much of this mass production is destined for north-eastern Siberia, which is within easy reach for both fighters and bombers of U.S. centres in Alaska. Nearly 50 air bases, airfields and landing strips are known to exist on Chukotski Peninsula, the nearest Soviet territory to the American continent across the Bering Strait, which is only 56 miles wide at its narrowest point.

Maralinga Range Tests

SCIENTIFIC staff, and service personnel from the Army and the R.A.F., are on their way to Australia to continue preparations for the atomic weapons tests due to take place there later this year. Preparations for the tests, which are to be held at the atomic weapons trials ground, Maralinga, South Australia, have already been begun by an Australian Service Force.

The range itself is now nearing completion. It has been constructed for the Ministry of Supply by the Kwinana Construction Group Pty., Ltd., comprising the U.K. firms of Messrs. Costain-John Brown, Ltd., and Messrs. D. and C. and Wm. Press, Ltd., who have employed many U.K. and Australian sub-contractors. Sir Alexander Gibb and Partners have been the consulting engineers.

The tests will be directed on behalf of the Minister of Supply by Sir William Penney, K.B.E., F.R.S., Director of the Atomic Weapons Research Establishment of the U.K. Atomic Energy Authority. A. Cdre. C. T. Weir, D.F.C., R.A.F., has with the agreement of the Australian authorities been appointed Services Commander to exercise operational control over the Services for Sir William Penney. He will have an air task force from the R.A.F. for the necessary supporting effort to the tests.

Sir William announced in Sydney that four atomic weapons would be exploded during the tests. One of them is to be dropped from a Valiant; it will be an operational weapon with smaller explosive power than the other three.

Czech and Polish Records

THE Czechoslovak pilot Frantisek Novak is reported to have beaten the F.A.I. Class C-1-c (1,000-1,750 km) record for distance over a closed circuit by flying a distance of 4,432.390 km (about 2,752.5 miles) in an unspecified type of aircraft. Pending homologation of this new figure, the record is held by a Russian, Yakov Forostenko, with a Yak-18.

Warsaw radio announces that the woman glider pilot Majewska, flying a Jaskolka single-seat glider, beat the distance to a declared goal record, F.A.I. Class D, by covering a distance of 573 km (about 355.8 miles) on August 10. The existing record is held by Mme. M.Choisnet-Gohard in an Air 100 at 507.052 km (about 314.87 miles).

U.S. Prestwick Move

ALL movements by air of American military personnel in Europe and the Near East are to be controlled from Prestwick after September 15, when No. 1602 Military Air Transport Service Wing—at present based near Munich—is transferring to the Scottish airport. The Wing will be commanded by Col. Rufus K. Ward. It was stated last week-end that Prestwick had been chosen because of its "ideal weather conditions and location."

Beside the existing American base on the north side of Prestwick Airport at Greenside, Monkton, new headquarters are to be built by the Air Ministry and leased to the U.S.A.F. New terminal buildings will eventually be erected on the American site and congestion will be eased in the booking hall used by civil airlines.

SOVIET PROVING FLIGHT: TO SIBERIA IN THE Tu-104

After years of pointless secrecy, even about the most undistinguished commercial aircraft, the Soviet Union—perhaps encouraged by the recent favourable reception at London Airport—has apparently decided to give Western-style publicity to the Tu-104. The pictures on these two pages were taken during one of the recent proving flights which the twin-turbojet 500 m.p.h. airliner has been making from Moscow and, with journalists and invited passengers on board, across Siberia. Below, the aircraft is seen during a refuelling stop at Omsk. On the right—the picture was taken from the navigator's station in the nose—is the pilot, Capt. Alexander Bystritski of Aeroflot.

A turn at the cruising height of 32,800 ft, with one of the massive main-undercarriage fairings and two wing fences in prominence.

(Right) Engineer Samokhvalova of the Civil Aviation Research Institute takes a sample of the air in the flight deck.

(Right) Alla Maklakova, one of Aeroflot's stewardesses, serves breakfast with a generous helping of laughter on the side.

Photographs by V. Mastyukov and A. Sofiisky

(Below) Settled on course, with everybody happy (except, it seems, one pensive gentleman). (Below, right) Steward Dima Kiryanov takes a telephoned breakfast order from one of the passengers. On the wall by his arm is an illuminated seating plan.

***SKYLANCER** is the name of this XF5D development of the Douglas F4D Skyray. It is more slender, more powerful and has a longer range.*

HERE AND THERE

F-100Cs in Holland

THE squadron of the U.S.A.F.'s 36th Fighter Day Wing which is detached at Soesterberg, Holland, has begun re-equipping with F-100Cs. The other squadrons at Bitburg, Germany, are already equipped (*Flight*, June 8). There will be 25 F-100s at Soesterberg, where supplies are regularly flown in by a Chase C-123B Provider.

Caravelle-Friendship Meeting

BOTH the Sud-Est Caravelle and the Fokker Friendship will be demonstrated at Schiphol Airport on September 27. The demonstration is being given during the second European Aeronautical Congress at Scheveningen, Holland, from September 25-29.

C.A.A. Viscount Incident

CONSIDERABLE damage to Viscount VP-YNE of Central African Airways was caused when the starboard undercarriage reportedly "collapsed" on landing at London Airport on Saturday last. There were no casualties.

Long-range Aid by Helicopter

THE longest helicopter ambulance flight yet undertaken in this country was made from St. Mawgan, Cornwall, last Sunday when a Whirlwind of No. 22 Squadron flew 70 miles to take off an injured seaman from a French trawler. The machine, piloted by F/L. R. L. Batten, carried a medical officer in addition to its normal crew of two.

Maritme St. Bernard

TWO London children who were adrift in a dinghy off the Dorset coast for 30 hours were found by a Shackleton of No. 42 Sqn., Coastal Command, from St. Eval, captained by F/L. D. Cowell. He dropped smoke markers which guided the Torbay and Exmouth lifeboats to the spot.

Sea Venom Inquiry

FOLLOWING the recall to base of the Australian aircraft-carrier *Melbourne*, after one of her Sea Venoms had dived in immediately after take-off, an investigation is being held in which representatives of the de Havilland Company will probably be asked to take part.

Frankfurt Meeting

ON September 23, at Frankfurt, U.S.A.F. F-100 Super Sabres, paratroops, a replica of Blériot's cross-Channel aircraft and 5,000 pigeons are due to take part in the first air show held there since 1939. A free-balloon flight, aerobatics by Hanna Reitsch and American pilots and model aircraft contests are also scheduled.

Radio Show Air Exhibits

THIS year's National Radio Show, on view at Earls Court, London, until September 1, has as one of its exhibits the timing equipment used for the Fairey F.D.2 world speed record run, with a representation of its use. The equipment has been loaned by the R.A.E. Also on view, at the R.A.F. stand, is a guided missiles exhibition, believed to be the most comprehensive yet seen by the public.

***PENTAGON CEREMONY:** Col. Horace A. Hanes (right) after being presented with the Mackay Trophy for 1955 by U.S.A.F. Chief of Staff Gen. Nathan F. Twining. The award was in recognition of the colonel's record of 822.135 m.p.h. in a F-100C (since resoundingly beaten by Peter Twiss in the F.D.2).*

Rotary Marathon

FROM Washington comes news that an H-21 (the Piasecki Work Horse) has set up what is claimed as a world record for helicopters by flying non-stop on August 11 for 1,199.07 miles. The previous longest flight, 778.3 miles, was made in France three years ago.

Swedish Model Win

IN the world contest for elastic-powered model aircraft, held last Sunday at Hoganas, south Sweden, the Wakefield Trophy was won by Lennart Petersson of Sweden. His total airborne time for five separate flights was 879 sec. Runners up were: Kothe, U.S.A. (874); J. O'Donnell, Britain (871); Knudsen, Denmark (871); Smirnov, U.S.S.R. (850); and H. O'Donnell (848). Sweden also won the F.A.I. Cup with a total time of 2,509 sec., followed by the U.S.S.R. (2,478) and Britain (2,469).

***HUMPING SUPPLIES** to a base camp of the New Zealand Antarctic expedition (now undergoing rigorous training in the New Zealand alps) is this unruffled-looking Auster.*

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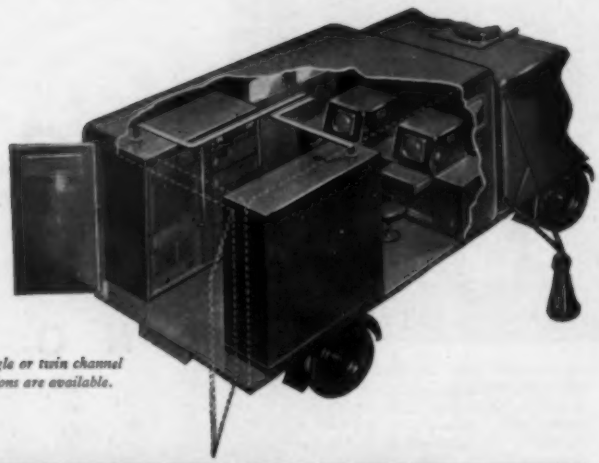

Either single or twin channel installations are available.

To be shown at Farnborough this year — a new Cossor high-power S-band surveillance radar, complete and self-contained in a single trailer. The Type 21 is a high-definition radar with a vertical coverage of 0-45° without beam tilting or switching. Moving target indication is provided and is fully controllable. Anti-rain facilities, including circular polarisation, are provided. All equipment is shock-mounted for rough terrain, and the cabin accommodates two operators and a technician. Peak power: 500KW.

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HERE AND THERE . . .

Canopy Jettisoned Accidentally . . .

ON Monday, August 13, an English Electric P.1 being test flown by Desmond de Villiers lost its cockpit canopy while over the Irish Sea. Mr. de Villiers was unhurt and landed the aircraft safely at Warton. This is the third time within twelve months that the P.1 has suffered a similar mishap.

. . . and on Purpose

AT El Segundo, California, tests have been successfully carried out to ensure that canopies can be jettisoned under water as well as in the air. Using a 24ft-deep tank and Douglas A4D, F4D and F5D forward fuselage sections, technicians have acted as "frogmen," submerging to retrieve the jettisoned canopy, make underwater repairs and inspect the triggering mechanisms. [Two years ago, M.L. Aviation Co., Ltd., produced a cartridge-operated device for under-water canopy jettisoning, suitable for use on D.H. Sea Venoms.]

THE SIKORSKY S-58 photographed at R.N.A.S. Lee-on-Solent air display, where, as reported last week, it was effectively demonstrated by Westland test pilot "Slim" Sear. With a Napier Gazelle free-turbine helicopter engine installed, it is eventually to be used for development trials in connection with the Westland Wessex.

MR. G. W. HALL, whose appointment as managing director of the Fairey Aviation Co., Ltd., was recently announced. He joined the company as an apprentice in 1925.

Egyptian Export Licences

THE Board of Trade has announced that as from August 16 licences are required for the export to Egypt of airframes and engine "parts, spares and components." Export of complete aircraft and engines is already subject to licensing for all destinations.

Quick Change

AT the American National Aircraft Show, due to be held on September 1-3 at Will Rogers Field, Oklahoma City, there will be a "high-speed engine-change" competition for the Allison Trophy. Four crews from the Flying Training Air Force of the Air Training Command, each consisting of a crew chief and five men, will be taking part. The aircraft will be Lockheed T-33s with Allison J33 engines. Last year a team from Webb Air Force Base, Texas, completed a change in 11 min 32.2 sec.

MR. WALTER HILL, O.B.E., has joined the Board of Flight Refuelling, Ltd. With Shell for nearly 37 years, he was in charge of the group's aviation facilities when he retired last December.

Voodoos in October

THE Strategic Air Command of the U.S.A.F. is to receive McDonnell F-101 Voodoos for squadron service in October. The Voodoo has a very long range and can carry nuclear weapons.

Consolation Prize

AFTER Peter Combes, a 16-year-old A.T.C. sergeant from Chelmsford, Essex, had failed to give the speed of a Beverley in answer to a TV aviation-quiz question, he was invited to Brough by the chairman of Blackburn and General Aircraft, Ltd., Mr. Eric Turner. There he flew with test pilot Dick Chandler and found out for himself the answer which would have won him a £100 cash prize: 175 m.p.h. at 11,500ft.

REVELATION IMMINENT: It is a safe assumption that the rather straight faces of these embarking passengers wore a different look at the end of the flight: they were about to sample the Bristol Britannia on the first of its American demonstration flights, from Idlewild on August 13.

DOLLAR REFLECTIONS

More Thoughts on British v. American Airline Equipment

WE devote this page to a letter received last week from a correspondent in the U.S.A.—an Englishman who has lived in that country for the past five years. In it, commenting on recent letters in our Correspondence columns, he deplores the prospect of B.O.A.C.'s intending purchase of U.S. jet airliners. Although this view is at variance with our own (see our leading article last week) we feel nevertheless that his letter will arouse interest. He is perhaps too unkind to B.O.A.C., and he does not mention the fact that the American airline industry has bought British aircraft. His most important omission, perhaps, is the fact that there is a limit to the number of projects which the British industry, because of its relatively small size, can tackle.

AS I suspected, your correspondent "Icarus" (*Flight*, June 1) is thrice confused—politically, economically and, above all, technically—in claiming once more that Britain can have a prosperous mercantile aviation divorced from its manufacturing base or *vice versa*. The interdependence of the two may be bunk to him, but the British aircraft worker, from artisan to designer, is going to have a very rough bunk to lie upon if his product has no commercial sales outlet. This is especially true in the case of B.O.A.C., because, as Sir Miles Thomas has so rightly said, it provides an international shop window for the British product. Perhaps "Icarus" works (and eats) behind the highly protected plate-glass window of the military Services?

Politically, it must be obvious that when a British airline "buys American," the repercussion is world-wide (the American publicist quite properly sees to that!), for it is tantamount to an admission that the British aircraft industry cannot build the vehicles for its own transport services; from which it follows that it won't have much chance of success against its keenest competitor in the international field. I have already cited the parallel of British ships and shipping. A more homely analogy may be studied in the history of British rail transport—bearing in mind that there are still large areas of the world where the pioneering influence of the British railway and locomotive engineer is apparent. Now that steam is giving way to diesel and electric, it would be fantastically silly if British Railways (i.e., the British taxpayer) decided to close down Swindon, Crewe, Derby and Doncaster in favour of importing the latest American types—even though (at the moment) they may be superior in some respects.

The economic reverberations are but the echoes of the political. The past (and forthcoming) financial tribulations of B.O.A.C. as an airline operator cannot be treated as an airtight segment of the British economy, dearly as it may wish to show a profit; but making a fast buck from American fares on the operational side is worthless if megabucks have to be prised out of the Treasury for buying American aircraft, which, be it noted, are still mostly on paper. And, apart from the actual first cost of these aircraft, there are all sorts of incidental dollar expenses incurred for the maintenance of B.O.A.C. inspection and training personnel in the U.S.A. In view of the continuing Anglo-American trade imbalance—a result of Icarus-type politico-economic thinking—will he please tell us where these hard dollars are to be found?

By-passing the Turboprop

On the technical issues, I agree that "Icarus" has more solid cause for confusion—due, largely, to the overdrawn transitional period between the piston engine and the gas turbine, especially in U.S. civil aviation; moreover, the confusion has grown yet more confounded by the conflicting claims of the turboprop and turbojet protagonists, so it is not surprising that many airline operators are still playing cagey at this stage of the game. The fact that B.O.A.C. sponsored and pioneered the world's first jet transport will always redound to their credit; but having courageously leapfrogged the interim turboprop hurdle, they have now retreated to stumble over it, and meanwhile our American competitors—after considerable vacillation—have by-passed it as a long-range vehicle altogether. Why dawdle along at 400 m.p.h. at 30,000ft, when you can whittle through the stratosphere (without bumps and without prop troubles) at 550 m.p.h.?

There can be little doubt, I think, that the recurring deficits of B.O.A.C. are mainly attributable to the ill-assorted mélange of aircraft types, both British and American, collected over the post-war decade. In the way of American types it began by faithfully copycatting the "lead" of PanAm with an unfortunate dead-end type boldly advertised as stratospheric, notwithstanding it was constrained to cruise in the troposphere—in common with nearly all piston-prop and turboprop transports. From this unhappy choice of the *third-best* American type then on the market (especially in terms of operating cost), one is compelled to conclude that the technical development side of B.O.A.C. lacks both imagineering instinct and critical faculty, plodding alongside the aircraft designer instead of prodding him. Worse still, at this writing, there are ominous signs that B.O.A.C.'s technical advisers, once more following the example of PanAm, will soon be plodding alongside the American designer—which, in our book, would be disastrously retrogressive. The shipbuilding copycatter of Kipling's day was only a year and a half behind the leader, whereas the aircraft design copyist of today will be backsliding at least ten years.

One had high hopes that in sponsoring the Comet family B.O.A.C. had seen a vision of an all-British jet highway, one essentially stratospheric and above the weather. "Icarus" is deluding himself if he imagines that Britannia is going to rule the air waves with a turboprop airliner. Optimistic dreams of prop-driven aircraft cruising at 500 m.p.h. are so visionary (and unnecessary) that they can be dismissed as wishful thinking. In my view, the M.R.E. specification of 1946 was unimaginative and the progress of a decade has made it still more so. We have to raise our sights into the N.E. quadrant of the speed-altitude envelope, although I must cheerfully differ from Vickers' George Edwards, who seems to be in favour of spending the next 10-12 years working up a supersonic airliner. Much better to rebuild the V-1000 by refining it into a VC-7B with jet flaps, thus saving a wad of money on airport real estate all over the global map.

There is another reported remark of Mr. Edwards which this old expatriate sees in a different light. This is the oft-repeated thesis that, in comparison with Great Britain, the U.S.A. (and now the U.S.S.R.) are big countries with long distances, *ergo* their own domestic market potential gives them the initial impulse for laying down a "break-even" production line. While it would be unrealistic to deny that the British Empire, as such, has shrunk considerably (because of its unique "virtue" in being politically self-liquidating!), there is still enough of it left in the Commonwealth of overseas dominions and colonies to offer the ideal situation for long-range routes, and thus the market prospects for operating them with British transport aircraft. The unpalatable fact that British Dominions, and even Crown Colonies, somehow find the dollars for American aircraft is admittedly a reflection on the U.K. manufacturer and his design team. We must stop looking inwardly and insularly at the British Isles when designing a British product. Mr. Edwards, of course, is almost unique among British designers in successfully invading the hard-dollar empire with turboprop hardware that fits into the short-haul domestic route pattern of most countries.

Underselling the Comet 4?

I should also like to proffer a brief retort to another correspondent who has joined issue with "Icarus" in your June 22 number. Technically speaking, I believe that Mr. A. S. Richardson is as confused over the relative merits of turboprop and turbojet as the opposition he is attacking. The current performance figures for the Comet 4, be it noted, are firmly based on the Comet 3 hardware, whereas long experience shows that one should be wary of publicity puffsterism. Conversely, and somewhat perversely, de Havillands seem bent on underselling the range performance of the Comet 4 by introducing a built-in paper headwind of 50 m.p.h., when publicising their Range *v.* Payload curves. I know of no American firm which undersells the operational range (i.e., with all fuel reserves, but with zero wind) of its aircraft by a good ten per cent in this fashion. For one thing, a 50 m.p.h. headwind allowance is insufficient on many routes under certain conditions. Which means to say that the airline operator figures in the headwind to suit each specific route and direction.

Further, in advocating that we buy American long-range (and long take-off) jetliners powered by British engines, Mr. Richardson is as badly off the political and economic beam as "Icarus." This half-baked loaf may *look* better than no bread, but in fact it advertises to all the world that the British airframe industry is an abject failure in this business of designing and producing a first-class pure jet transport; moreover, it clearly violates the last sentence of his letter: "Let us buy the best *aircraft* for the job, only give British manufacturers the opportunity to prove that they can produce the best." How? By purchasing and then copycatting those podded military freaks? American jetliners with British turbojets for British airlines are as incongruous as would have been British shipyards calling for American hulls when Parsons invented the steam turbine towards the end of the nineteenth century. We must knead British dough for baking the full loaf, thereby keeping the dough in British pockets.

FAVONIUS.

A Solent of Aquila Airways is seen in this fine picture, taken after alighting at Southampton last week. On board were wives and children of British civilians employed at Suez, who were being evacuated by air owing to the political situation. Britavia Hermes shared the airlift.

CIVIL AVIATION

BRITANNIA IN THE U.S. LIMELIGHT

THE glare of the limelight in which the Britannia has been touring the U.S.A. and Canada seems to have been exceedingly strong. As we went to press, 30,000 Americans had walked through the aircraft (15,000 of them at Los Angeles International) and an estimated 300 U.S. airline executives had flown in it. Up to the time of its arrival in Vancouver last Sunday evening, the Britannia had made eight demonstration flights. Three of these were given at San Diego, whence, last Friday, the aircraft flew to Burbank, the home of its keenest U.S. rival, the Electra. Mr. Masefield and his colleagues lunched with Lockheed before making the short hop to Los Angeles International, where two more demonstration flights were given. By the time of its arrival in Vancouver (1,100 miles from Los Angeles at a block speed of 325 m.p.h.) the Britannia had flown about 9,000 miles in 30 hr.

AIRWORK ACQUIRE TRANSAIR

RUMOURS earlier in the summer of a move among the British independents to consolidate their strengths (*Flight*, June 8) could, it now appears, probably be traced to discussions between Airwork and Transair that they should join forces. Formal announcement that Airwork have in fact acquired the share capital of Transair was made on August 20. This in no way affects the identities of either company, both of which will continue to function as separate units. Airwork's chairman and managing director, Mr. M. D. N. Wyatt, and the director and secretary, Mr. R. L. Cumming, have joined the Transair board, while Mr. G. H. Freeman (who is, incidentally, chairman of the British Independent Air Transport Association) remains chairman and managing director of Transair with a seat on Airwork's board.

CAPITAL'S FIRST VISCOUNT YEAR

WE published in our issue of July 13 a comparison between Capital's estimate of Viscount costs made in May 1954 with actual operating results over the first nine months. Capital have now issued some details of their first full Viscount year—July 26, 1955 to July 26, 1956. The results have, they say, "exceeded the fondest hopes," and Capital sum the aircraft up by saying that "its new sound in the sky" had created "a new sound in the cash register."

Load factors on the Washington-Chicago route increased by no less than 199 per cent; in the first four months of 1956 a total of 33,802 passengers were boarded on the route compared with only 11,322 for the same period in the previous year—a growth which is the more astounding since it is on a route served by four major airlines. Engine time of Capital's Viscount fleet amounted to 88,000 hr without a single failure in the air.

FILLING UP THE BIG JETS

"NO need for panic" is the conclusion drawn by M. Gilbert Perier of Sabena from his study of the questions as to whether the 218 DC-8s and 707s now ordered will provide more capacity in the sixties than anticipated traffic-growth can fill. In an article in the Summer 1956 issue of the *I.A.T.A. Bulletin* (M. Perier is a member of I.A.T.A.'s executive committee) he points out that the average growth of world traffic has been about 16-18 per cent annually; in 1955 about 4,600 million long-ton miles were sold on international operations, and "if we are willing to be just slightly optimistic and to assume that this figure will increase at the rate of 18 per cent annually," it will be about 12,000 million ton-miles in 1961. Assuming that the average load factor of I.A.T.A. airlines remains constant at 60 per cent, a capacity of 20,000 million ton-miles will have to be available in 1961 to meet demands. He estimates the output of DC-7Cs, L.1649As, Britannias, DC-8s and 707s now on order at 11,000 million ton-miles by 1961. And, Mr. Perier continues, add to that the 7,350 million ton-miles capacity of the existing fleet, and "there will still be an important margin between supply and demand."

This "important margin" is actually—on M. Perier's figures—the ratio between about 18,000 "C.T.M.s provided" and a 12,000 "L.T.M.s sold"—i.e., a load factor of 67 per cent, or more than I.A.T.A.'s average. In other words it appears that in 1961 there may still not be enough seats available on international routes.

Perhaps M. Perier's assessment of DC-7C, Britannia, 1649A, 707 and DC-8 capacity, which he estimates at 11,000m ton-miles, is not high enough? But our own calculation of this capacity, based on present orders, is even lower than his—about 6,500m ton-miles. And we have assumed a high 3,000 hr annual utilization per aircraft, and included Comets and all 210-odd 707s and DC-8s which are on order—many of which will not be used on international operations at all. Thus on either reckoning it looks as though there is still not enough capacity on order to meet international demand in 1961.

"TEX" JOHNSTON ON THE 707

BOEING'S chief test pilot, "Tex" Johnston, was one of the speakers at the recent National Turbine-Powered Air Transportation Meeting at San Diego. "Tex" had quite a lot to say about his experiences flight-testing the 707, and two of the snags encountered are worth recording, as they seem to be the sort of thing that could "happen to anyone." The brake failure that occurred early in the programme, and which resulted in the loss of the nose leg in the subsequent ground-loop, was caused in the following way. Prior to take-off braking tests had increased the temperature of the hydraulic fluid which at high altitude cooled off and contracted. The cut-outs interpreted this as a break in the hydraulic line and no pressure could be metered to the brakes.

A second incident occurred when a tyre blew at 22,000ft and caught fire (the explosion, said Tex, was "similar to someone shooting both barrels of a 12-bore shotgun in the cockpit"). An investigation later revealed that the particular type of brake concerned was a very good heat reservoir, storing heat in the internal portion of the brake. This had not been noted by Boeing inspectors after pre-flight braking tests, and during the subsequent flight this heat had radiated out into the tyres.

The prototype 707, a report on which appears on this page, was recently the subject of "airport behaviour" tests at Boeing Field, observed by airline and C.A.A. officials. Here is a good view of one of its J57 sound-suppressors. Based on the Geatrex (Rolls-Royce) principle, it comprises eight channel segments within the jet pipe.

CIVIL AVIATION . . .

BEA's BEST YEAR YET

LAST year we recorded that British European Airways had achieved their first profit since the corporation's birth in 1946 —a modest £63,000. This year (i.e., the financial year ended March 31, 1956) the airline has improved its surplus tenfold. The net profit, after deduction of capital interest* and so forth from a £1,201,569 gross profit, is £603,614.

Examining the annual report, made public last Wednesday, August 22, we find that this surplus was achieved from an increase in revenue (up by a quarter to £21,599,494), and a decrease in the cost of production. This latter quantity, which is perhaps more a measure of efficiency than revenue earned, was actually 40.5d per capacity ton-mile—a 2.9 per cent decrease which, although not as great as last year's decrease, was nevertheless achieved despite rising costs. Wages, for example, went up 14 per cent, but productivity per employee increased by a fifth to 13,028 C.T.Ms.

Essential figures are tabulated below: two are of especial interest. For the first time more than two million people flew by B.E.A., one million of them within the U.K. at a 74 per cent load factor. The combined domestic and international passenger load factor was the highest yet—69.4 per cent, a figure which seems to represent a fair balance of seats offered to seats filled, especially in a business as violently seasonal as that of Europe. (The average passenger load-factor achieved by other European operators in 1955 was 56.3 per cent). *Overall* revenue load factor, i.e., including mail and freight, dropped slightly, even though business in this type of traffic increased: this was due to the increase in cargo space offered by larger aircraft operating at higher frequencies. Obviously, there is scope here in the future for an even further intensification of B.E.A.'s drive for freight. (An increase of 32 per cent in this class of business was the reward in the year under review for renewed cargo efforts.) Nevertheless the overall load factor achieved, 63.2 per cent, is good; and coupled with the use of increasingly larger and more economical Viscounts (the first of 24 larger 802s will be in full use by the spring), it is undoubtedly the foundation of B.E.A.'s improving financial health.

Fares have been reduced by B.E.A. since 1950 by nearly seven per cent, against the background of a 30 per cent increase in cost-of-living. Reductions have been more on international services than on domestic routes (although of course the latter's rate is less at about 4.8d per mile compared with about 6.4d), and B.E.A.'s policy is to encourage the development of more traffic by off-peak reductions. For example, more and cheaper night services will be provided on international routes this year, and fare inducements will, it is hoped, stimulate more mid-week travel. However, a domestic warning-note is struck in the report: "In spite of good load-factors, [domestic] routes do not yet make a profit on total costs including an apportionment of all overheads. It may, therefore, eventually be necessary to make some upward adjustment in fares to improve the economics of the domestic routes."

The regularity of B.E.A.'s services was maintained at 97 per cent, although punctuality was down: 76.6 per cent of services arrived within 15 min of schedule compared with 81.8 per cent in the previous year. This deterioration in punctuality mainly resulted from a shortage of aircraft, as well as worsening road congestion between Waterloo and London Airport—a frequent cause of late departures.

On the subject of helicopter services, B.E.A.'s report foresees the possibility of turbine-engined variants of the Bristol 173 in operation by the early sixties, and full self-supporting helicopter services between city-centres after the mid-sixties.

Total capital stands at £16.5m. A sum of £1,936,753 was set aside for amortization of aircraft and depreciation of assets.

B.E.A. RESULTS, 1955-1956

Capacity ton-miles flown	124,478,837	+26.6 per cent
Load ton-miles sold	78,670,464	+23.6 per cent
Revenue load factor	63.2 per cent	−2.3 per cent
Passenger load factor	69.4 per cent	+1.5 per cent
Passengers carried	2,224,747	+18.7 per cent
Passenger-miles flown	708,769,182	+22.8 per cent
Freight ton-miles	7,547,708	+31.8 per cent
Operating revenue	£21,599,494	+26.0 per cent
Total expenditure*	£20,995,880	+22.9 per cent
Net profit	£603,614	+£540,575
Cost per capacity ton-mile	40.5d.	−2.9 per cent
Traffic revenue per load ton-mile	63.6d.	+1.6 per cent
Unduplicated route-mileage	25,367	21,190

* An exceptional item here was £300,000 spent on Elizabethan fatigue-testing and modifications.

B.E.A.'s FLEET, 1955-1956

	Av. Sector Dist. (miles)	Cost/C.T.M. (pence)	Cost/seat-mile (pence)	Utilization (hr)
Viscount	466	34.6	4.3	2,217*
Elizabethan	346	46.5	5.4	2,230
DC-3 Pionair	162	44.7	5.0	1,570
Heron	98	120.7	9.3	546
Rapide	39	94.3	9.7	727

* Increase of 28.6 per cent on 1954/55.

BREVITIES

RESUMPTION of negotiations toward an inter-line agreement between B.E.A. and Aeroflot is anticipated by a report from Moscow that the chairman of the Russian airline, Marshal Semyon Zhavoronkov, is to visit London.

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Last week Skyways carried their 50,000th passenger on their low-fare Coach-air service between London and Paris. Up to ten return trips a day are now being operated.

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Work on the new terminal building at Gatwick Airport is about to begin. Runway extensions are already in hand in anticipation of Gatwick's completion by 1958 as London's second airport.

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Viking D-ABEL of Lufttransport Union, one of West Germany's new charter companies (*Flight*, July 20), flew into Budapest on August 12. It was the first time a West German aircraft had landed in a communist country.

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B.O.A.C. completed its round-the-world inter-office teleprinter circuit as a result of an agreement with Qantas to use its trans-Pacific chain. This will greatly speed up confirmation of seat reservations.

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The avoidance of landing accidents is the purpose behind an important new M.T.C.A. circular (No. 96) just issued. It collates for the first time all the information obtained from such accidents as well as from international research into the effects of different conditions on landing distance.

We do not know to what extent good looks count in the choice of new equipment; but no one, we suspect, could be entirely indifferent to the physical attractions of the new 300 series Britannia. Here it is, in the first air-to-air view, in 301-prototype form. Vital statistics are a 25 per cent break-even load factor over 200-mile routes, and a guaranteed cruising speed of 400 m.p.h.

CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns; the names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

Ideal Executive Aircraft

YOUR cry from the heart for a good executive aircraft [leading article, August 10] brings an answering vibration from mine. What has happened to the British aircraft industry? Isn't there one firm which is prepared to risk two or three hundred thousand to prototype and market such a machine?

With respect, I would suggest that your specification is too conservative. The aircraft you describe already exists in several forms in the U.S.A.—for instance, the beautiful little Piper Apache.

My own dream would be a twin-turboprop-powered high-wing monoplane cruising at 200 knots at any height I choose between 8,000 and 20,000ft for a range of about 1,000 nautical miles. The cabin would be pressurized and soundproofed and would seat 4-6 people in real comfort. There would be a small toilet and wash-basin. The seating would be easily removable and replaceable by 8-10 very small seats for short trips. The undercarriage would be designed for grass, and full radio and navigational aids would be fitted.

Such an aeroplane would not only provide a tonic to the flagging but persevering British pilot but I believe it would sell in every big country in the world. In addition, what a wonderful communications aircraft for the R.A.F. and R.N.! If someone in Britain doesn't do it in the next year or two, the Americans will have it on the market for sure.

The a.u.w. should be 8,000-9,000 lb and the price—well, our U.S. friends can do the Apache for under $40,000 so surely we could do this one—in fair quantity—for about £30,000.

It should be the finest thing in its class in the world—a quality that always sells whatever happens to all the "in between" types. How about it, Rolls-Royce, have you got room for another project at Derby?

Belfast. SLIPSTICK.

Arrival Signals that Don't

I READ your article "Assignment in Italy" (August 10) with considerable interest, as while your contributor was on his assignment I was on a holiday in a Messenger, without such refinements as V.H.F., to Barcelona, Cannes, Geneva and Luxembourg and saw the *Flight* Gemini over Cannes on its return trip.

As a result of my flight, I would like to make a very serious plea for the re-introduction of the "arrival signal." On arriving at one airfield (not mentioned above, incidentally), I was greeted by two officials, eagerly inquiring where I had come from; my heart sank, as I was pretty certain that Control had not received my flight plan, otherwise these people would know my airfield of departure. After clearing Customs, etc., I inquired at Air Traffic about my flight plan; and, as I had feared, they had not received it, nor, as far as I could make out, had it arrived the following day. Mercifully, engine failures are not now a frequent occurrence, but had I been unfortunate on this particular trip, and had an accident, no action whatsoever could have been taken by the elaborate rescue organizations, as, so far as the airfield of arrival was concerned, I had never been airborne!

Whilst I appreciate that communications traffic is heavy, an arrival signal does not take very long to send and, unless it is re-introduced, someone is bound to go missing, sooner or later, and no one will know anything about it until it is too late.

Finally, I would say that this was not the first time this year that I have experienced the above occurrence, and one flight (not in a Messenger) involved a sea crossing of some two and a half hours!

Blackrock, Dublin. A. C. MORGAN.

[All the flight plans filed during C. M. Lambert's journey reached their destination before the aircraft, but at least one of them was so mutilated that it was hardly understandable. In any case, full details of registration and departure point were usually requested over the radio when the aircraft was in the circuit, and they were often asked for again on the ground.—Ed.]

Airliner Work-capacity

IN *Flight* for July 6 you assert: "In the Britannia, Bristol have a transport with a greater work-capacity than anything else at present flying and available for purchase." For the past six years you have praised this feature of the Britannia, often in extravagant terms, without explaining what might be the commercial advantage of a large range-payload product.

Of far greater importance to an operator is the *rate* of work-capacity—the product of block speed and payload—which has the dimensions of power and determines the number of vehicles required to handle a given density of traffic on a given route. The working power of the Britannias now flying is around 3,000 short-ton knots [3,500 short-ton statute miles would be more accurate.—Ed.]: as others have pointed out, this product is of the same order of magnitude as a ship with comparable installed horsepower.

On a recent visit to England I travelled non-stop in a DC-7B of considerable service, which had a working power of about the same value as the Britannias promised for B.O.A.C. I don't know whether you would consider the Comet 4, Caravelle, or Tu-104 as "available for purchase," but all these aircraft have a working power at least as great as the proposed Britannia 310, making up in speed what they lack in payload. And the 707 and DC-8 will have products twice as great—that is, an operator planning for 1959 would have to order two Britannias to do the work of one of the big jets.

The distinction between work-capacity and power-capacity is more than pedantic nicety. Brunel mistook it over a century ago, when he built the *Great Eastern* with a range of 22,000 miles to avoid stops for refuelling. The result was a huge but hopelessly underpowered ship which never plied the route for which it was intended, and ruined every syndicate which operated it. If you will excuse the reminder, Bristol repeated the error in 1945-53, when they tried to build a fleet of non-stop trans-Atlantic Brabazons.

Cincinnati, Ohio. J. M. STEPHENSON.

[Mr. Stephenson assumes that we interpreted work-capacity as payload × range, which we did not; work-capacity is, as he says, the product of payload and speed. It works out for the 400 m.p.h. Britannia 310 (the version to which we were referring) as about 5,600 short-ton miles per hour. No other civil aircraft available for purchase, except the 707 and the DC-8, can match this.—Ed.]

THE INDUSTRY IN BRIEF

Heenan and Froude, Ltd., of Worcester, have received an order for aircraft engine test plant amounting to £60,000, to be supplied to Air India International, Ltd., of Bombay.

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An addition to the manufacturers' list of "contributors to the Herald" (*Flight*, July 27) is the name of Aero Research, Ltd., whose honeycomb material, with Redux film adhesive 775R, is used for the sandwich-construction floor panels.

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Mr. E. T. Gill, B.Sc., F.I.M., has joined the development and research department of the Mond Nickel Co., Ltd., as development officer for constructional alloy steels. He thus fills the position left vacant when Mr. L. W. Johnson was appointed the department's assistant manager.

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Mr. J. Dee Shapland, B.Sc., A.C.G.I., A.M.I.Chem.E., has been appointed to the Board of Foamite, Ltd., manufacturers of fire-fighting equipment and a subsidiary of Tecalemit, Ltd., Plymouth. He has also been made chief chemical engineer to the parent company. Mr. Shapland joined Foamite in 1950 as their chemical engineer, later becoming technical manager. During the last five years he has been principally concerned with the development of foam systems of fire fighting, mainly concentrating on refinery protection and the development of aircraft crash fire tenders.

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The telephone number of Stewart Aeronautical Supply Co., Ltd., at their new Crawley, Sussex, premises (the address of which was given in our August 3 issue) is Horley 4300.

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Mullard, Ltd., offer on loan a series of 16 mm sound films on various aspects of electronics, made in entertaining form for presentation to a wide audience. Details are obtainable from the Mullard Film Service, Publicity Division, 1 Gerrard Place, London, W.1.

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The appointment of W/C. J. R. C. Lane, A.F.R.Ae.S., R.A.F.(retd.), as service manager to Irving Air Chute of Gt. Britain, Ltd., has been announced. He will be in charge of the technical services group and responsible to Mr. W. D. Brown, the company's director of research and development. W/C. Lane was recently director of technical services to the Pakistan Air Force.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

Congratulated by A.V-M. G. P. Chamberlain and the German Ambassador, Herr von Herwarth, are the German pilots who received their wings after training with the R.A.F., Maj. W. G. Krupinski, Lt-Col. H. A. H. Wehnelt and Maj. G. F. Barkhorn.

R.Aux.A.F. Salute

WHEN the Queen and the Duke of Edinburgh came to Leith harbour in the Royal Yacht *Britannia* last Sunday, four Vampires of No. 603 (City of Edinburgh) Sqn., R.Aux.A.F., flew past in salute. The Queen is the squadron's Honorary Air Commodore.

Senior Appointments

THE Air Ministry announces the appointment of A.V-M. P. B. L. Potter to be Director General of R.A.F. Medical Services, with the acting rank of air marshal, with effect from February next year, in succession to Air Marshal Sir James Kilpatrick, who will be retiring.

A. Cdre. J. Worrall is appointed A.O.A. at H.Q. Flying Training Command with effect from August 20 with the acting rank of air vice-marshal.

A. Cdre. G. A. M. Knight is to be Principal Medical Officer, 2nd T.A.F., with effect from September 10, and A. Cdre. L. M. Corbet is to be Deputy Director of Medical Services at Air Ministry with effect from October 1.

A.V-M. Sir Hazelton Nicholl

WE regret to record the death last week of A.V-M. Sir Hazelton R. Nicholl, Controller of the R.A.F. Benevolent Fund. He served from 1899 to 1902 in the London Scottish Volunteers and then in the South Rhodesia Volunteers. In 1915 he qualified as a pilot at Brooklands, joined the R.F.C. and served with Nos. 8, 84, 86 and 110 Sqns., commanding the last-named unit. After World War I he was granted a permanent commission and in 1926 took command of No. 70 (Bomber) Sqn. at Hinaidi. Three years later he was promoted C.B.E. for his services there in connection with the operations against the Akhwan in the Southern Desert. Then he became Deputy Director first of Training, then of Personal Services, then of Manning. In 1935 he was lent to the Australian Government and served as Air Member for Personnel on the Air Board of the R.A.A.F. He was appointed A.O.C. in the Middle East in 1938, until he was succeeded by Air Marshal Sir William Mitchell when the appointment was raised to that of A.O.C-in-C. After serving as A.O.A. Fighter Command, he retired in 1942 and joined B.O.A.C. for a period.

R.A.F. at Gardermoen

HUNTERS and Canberras took part, with aircraft from Norway, Sweden and America, in the annual Norwegian air show at Gardermoen, near Oslo, on August 19. In spite of a downpour, which prevented the rendering of an opening sonic boom, the Hunters and Canberras are reported to have acquitted themselves well.

New Bishop for the Forces

A NEW bishop has been appointed to take over the duties of the Right Rev. Cuthbert Bardsley, now Bishop of Coventry, as the Archbishop of Canterbury's episcopal representative with the Forces. He is the Rev. S. Betts, vicar of Holy Trinity, Cambridge, who will become suffragan bishop of Maidstone. This bishopric has been vacant for ten years and has been revived specially for the purpose.

On several occasions in recent months U.S. Naval aircraft have landed on British carriers to gain experience of the mirror sight, now officially called Optical Glide-Path Indicator. Here a Grumman F9F Cougar from U.S.S. "Intrepid" makes a "touch and go" aboard H.M.S. "Eagle" in the Mediterranean during the recent Exercise Maltex.

No. 155 Sqn. Airlift

NINE Whirlwinds of No. 155 Sqn. in Malaya recently lifted 355 troops and 5,100 lb of cargo into jungle clearings during a three-day anti-terrorist operation on the Malaya/Thailand border. More than 200 sorties were flown from Kuala Lumpur on to rapidly prepared bamboo-platform landing sites in swampy areas.

Tour de l'R.A.F.

THE five-day R.A.F. cycle race over a 467-mile route from R.A.F. Wilmslow to R.A.F. Abingdon ended last Friday in victory for L.A/C. L. Gill of Cosford, who was riding for Technical Training Command. Second was S.A/C. I. Sandbach, with L.A/C. J. Warren a close third. The team championship was won by Technical Training Command and the rider gaining most points for climbing selected hills during the race was S.A/C. I. Sandbach, who is stationed at R.A.F. Stafford.

The race was organized in much the same way as major continental events, with the winner of each day's run wearing a distinctive jersey the next day. Night stops were made at R.A.F. stations.

R.A.F. Lawn Tennis Victory

THE R.A.F. achieved an overwhelming victory in the Services lawn tennis championship at Wimbledon last week, winning 12 matches. The Army came second with four wins and the Navy third with two. In the women's championships the W.R.A.F. came third.

Royal Visit Standard Bearer

IN a caption to an Air Ministry photograph of the Queen presenting a standard to No. 207 Sqn. (published on August 3, page 178), the name of the Standard-bearer was given as F/O. R. C. Havers, according to official information. We now learn that this should have read F/O. R. C. Haven.

Reunion

THE M.R.E.S. Officers' eighth reunion will take the form of a dinner to be held on October 27. Particulars from S/L. P. E. Laughton-Bramley, M.B.E., 18A Cadogan Place, London, S.W.1.

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Commonwealth Aviation

1956

THE AIRCRAFT

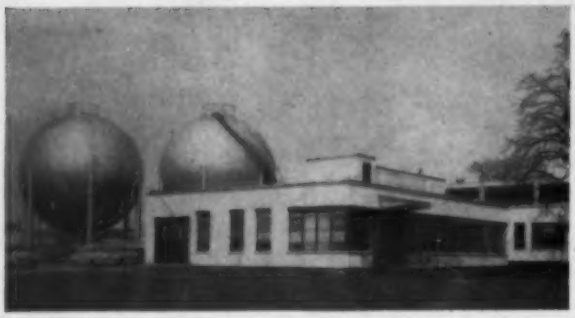
From the mighty delta CF-105, now taking shape at Toronto, and the bush-tailored Beavers and Otters; to the Winjeel and HT-2 trainers indigenous to Australia and India, the great young factories of the British Commonwealth can show original and successful designs as well as potent local adaptations of U.K.- and U.S.-born machines. One function of this special issue is to present an up-to-date review of all these Commonwealth aircraft, in which respect it forms the first half of a story that is completed with next week's Farnborough-time review of aircraft and products of the Home Country itself.

THE INDUSTRY

Responsible for these aircraft is a widespread multitude of factories, each with its own particular atmosphere, scale of effort, products and problems. In sheer volume of production and in variety of aircraft types those of the Dominion of Canada take pride of place, and many pages of this special feature are devoted to current Canadian progress. The industries of Australia, New Zealand and India are also reviewed, and the broad background to Commonwealth aviation is sketched in with the inclusion of topical articles on research, Service flying and civil air transport, in addition to the detailed reports on companies, aircraft and engines.

The laboratories of the National Research Council (above) are located at Montreal Road, Ottawa. Top right, elevator adjustment on delta half-model in 30in x 16in supersonic tunnel.

Right, the N.R.C. high-speed aerodynamics laboratory. The two Horton spheres provide a common vacuum for the two main tunnels.



Progress in Research

AT TWO CANADIAN ESTABLISHMENTS

THE pattern of Canada's aeronautical research is not a simple one; nor is it static. Developed over the years in parallel with the expansion of industry and the Services, the framework is now being further modified to meet the present-day needs of a country which is devoting increasingly more brainpower to selected aspects of basic research, as well as to applied problems of development.

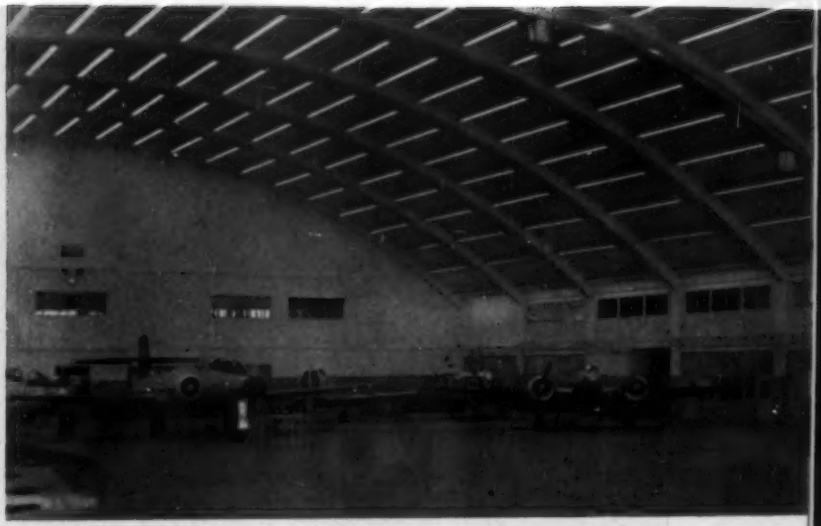
The aeronautical laboratories of the National Research Council at Montreal Road, Ottawa, have for many years been the centre of Canadian aeronautical research. A more recent unit on the scene is the National Aeronautical Establishment, located at Uplands Airport, Ottawa, which was formed only five years ago and is at present operated by the N.R.C.

The work of the two establishments is very closely integrated indeed, with wind-tunnel and laboratory work being carried out at N.R.C. and flight testing (and associated work) at the N.A.E. The present stage is a transitional one, however, and with the building up of tunnel and other facilities at Uplands this establishment will be taken over by the Defence Research Board (the research organization of the Department of National Defence), and the N.A.E. emphasis will be placed on research and development for military and defence purposes. Up to the present time the N.R.C. has performed both fundamental research and *ad hoc* investigations into military applications; when the National Aeronautical Establishment is fully developed, N.R.C. will revert largely to its rôle of basic study and experiment.

On a recent visit to Ottawa, *Flight* was shown around the two establishments by Dr. D. C. MacPhail, assistant director of the mechanical engineering division of the N.R.C. (Mr. J. H. Parkin, C.B.E., director of the division, is also director of the N.A.E.). At the Montreal Road laboratories, the aerodynamics section possesses four main wind-tunnels, plus a pilot tunnel which is a 1/12th scale working model of a 5ft × 5ft supersonic tunnel which has been designed at N.R.C. for the N.A.E. at Uplands. The low-speed laboratory contains a conventional 10ft × 6ft tunnel capable of air speeds up to 300 m.p.h., and a 15ft diameter spinning tunnel. Major high-speed facilities comprise a 16in × 30in intermittent transonic tunnel (Mach 0.5 to 2.0) with a ventilated working-section; and a 10in × 10in supersonic tunnel (up to Mach 3), also of the intermittent type.

Other aeronautical facilities at the N.R.C. are seen in the thermodynamics and mechanics sections. The former contains a gas

The 16in x 30in high-speed tunnel at N.R.C. Mach number range is 0.5 to 2.0, slotted liners being used for subsonic and transonic testing.



Recent N.A.E. projects include investigation of area-rule version of Canadair Sabre. Above, the Flight Research Section hangar at Uplands

dynamics laboratory, where the work on gas turbines covers the fields of combustion, aerodynamics and thermodynamics of compressors and turbines, heat transfer and measurements and instrumentation; and an engine laboratory with five large test-cells (in one of which re-heat development work was being carried out on an Orenda turbojet); and a low-temperature laboratory possessing two icing tunnels and three cold chambers for the investigation of the problems of low-temperature operation of aircraft, engines and equipment. The refrigeration plant of the low-temperature section is at present being adapted to refrigerate one of the engine test cells used for icing tests on turbojets, in order to obtain air temperatures below the winter ambient.

The structures laboratory of the mechanics department handles static and dynamic investigations into aircraft structures, aeroelastic studies of swept wings, and work on aircraft hydraulic systems, and employs an electronic analogue computor in some phases of the theoretical and analytical work. Other units of this department are the aircraft instrument laboratory (with full environmental test facilities) and the engineering section, whose work has included the design of wind tunnels and the development of a variable-area nozzle for turbojets.

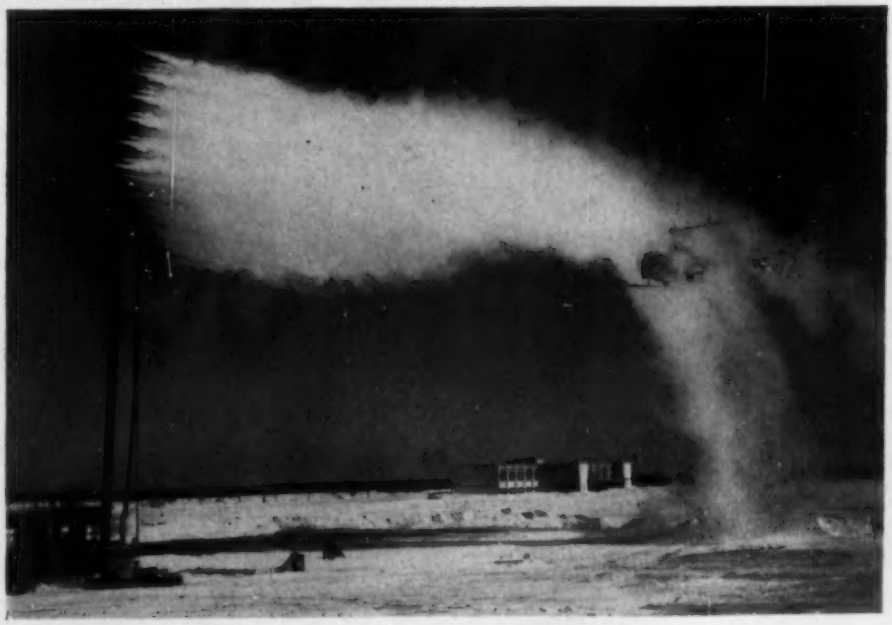
Among the other facilities of the division of mechanical engineering are well-equipped workshops, and an aeronautical library stated to comprise the largest collection of aeronautical research information in Canada.

At Uplands Airport the main facility of the National Aeronautical Establishment at present is the flight research section. In the well-designed hangar at the time of our visit was a varied selection of current Canadian aircraft types, the more interesting being the area-ruled version of the Canadair Sabre and a CF-100 fitted with vortex generators. All flight operations are carried out by an R.C.A.F. group, and are dovetailed into a programme which includes work for various departments of the N.R.C., for other government departments and for the aircraft companies.

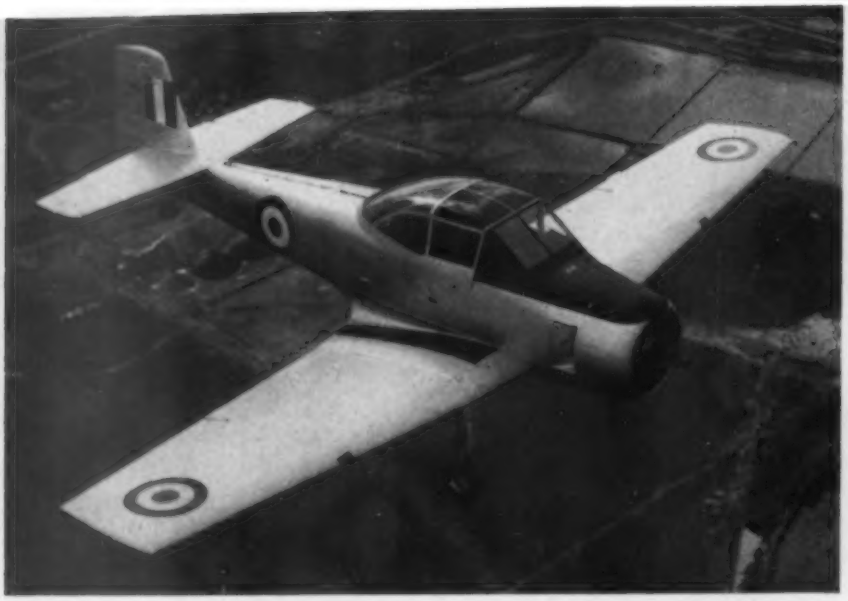
To plan and interpret the flight investigations, there are four technical groups of engineers and scientists at N.A.E., concerned respectively with aerodynamics, instrumentation, mechanical design and special projects. Their laboratories and offices form part of the hangar. One of the recent "special" projects related to a repeating parachute, which was devised to increase the height and accuracy of supply drops from aircraft.

The facilities of the N.R.C. and N.A.E., illustrated on these pages, are not the only ones available to Canada's aviation industry and air Services. They are effectively backed up by others such as the Institute of Aerophysics at Toronto University and the Gas Dynamics Laboratory at McGill; the Canadian Armament Research and Development Establishment at Valcartier (which handled the Velvet Glove missile project); and—to an increasing extent—the facilities of individual firms in the industry. There are test ranges also. At the range operated by CARDE at Picton, Ontario, dynamic models of the CF-105 have been tested in rocket-boosted free flight; and the guided weapons test range which was established at the Air Armament Testing Centre, Cold Lake, Northern Alberta, by the Defence Research Board is now being operated by the R.C.A.F.

The eventual pattern of research facilities which emerges will, it is intended, provide a sound base for fundamental research and also one which will meet the needs of an aircraft industry which has grown and stabilized to an amazing degree over the past ten years. In general, research facilities have not in the past kept pace—which is why Canada has had to go to the U.S.A. for wind-tunnel time in connection with the development of the CF-105. The forthcoming Mach 4.5 tunnel at Uplands, and the building-up of other facilities there, is an indication of the progress being made towards a self-sufficient aeronautical research organization in Canada.



Helicopter rotor icing, as provided at N.A.E., Uplands. This striking picture shows a Bell 47 immersed in the cloud from the 143 steam-atomized-water nozzles of the Establishment's spray rig.



Powerplant	P. and W. Wasp Junior
Span	38ft 9in
Length	28ft 10½in
Gross weight	4,235 lb
Max. speed	187 m.p.h.

COMMONWEALTH AVIATION *The Aircraft*

AUSTRALIA

Commonwealth CA-22 Winjeel. Forming the basic standard trainer of the R.A.A.F., the Winjeel fills the same rôle as the R.A.F.'s Hunting Percival Provost, which it closely resembles both in appearance and in function. The prototype aircraft first flew in 1951, but subsequent development was limited by a shift of emphasis to the production of the Avon-powered Sabre. The first Winjeel was, however, delivered to the R.A.A.F. in March last year, since when output has been progressively increased. An order has been placed for 62 Winjeels, and delivery to the R.A.A.F. of at least 25 aircraft powered with Wasp Junior engines has taken place.

The 455 h.p. Wasp Junior has been adopted as the standard powerplant for the Winjeel, although it was originally intended that the second half of the production batch should be powered by the all-Australian 450 h.p. Cicada engine. Should emergency production ever be required, the seven cylinder radial Cicada would provide a useful reserve design.

Of all-metal construction, the Winjeel is a simple and robust aircraft. Instructor and pupil sit side by side and—following immediate post-war R.A.F. practice—a second pupil is carried behind the right-hand seat. Access to the engine installation is made easy by the fitment of a four-piece petal cowling.

Commonwealth CA-27 Avon Sabre. In the Avon-powered Sabre the R.A.A.F. have one of the world's outstanding day fighters. The Australian decision to build this Rolls-Royce powered North American airframe was taken in 1951 and has proved to be a happy one—the combination has proved no less successful than the World War II Merlin-Mustang. The first production CA-27 was handed over to the R.A.A.F. just a year after the prototype first flew in August 1953. The original order for 72 Avon Sabres has been increased to 90, two-thirds of which are now complete. Further orders are anticipated.

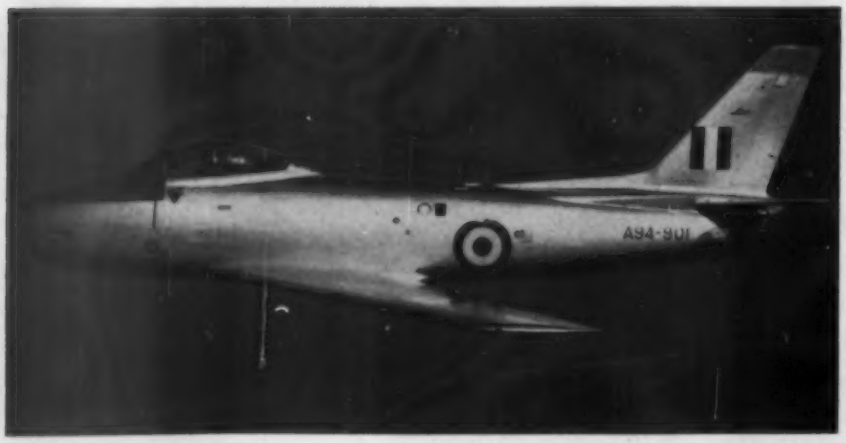
Based on the F-86F, the Australian CA-27 design has a considerably enhanced performance by virtue of its Commonwealth-built Avon 20, which gives 50 per cent more thrust than the American J47. As the Avon consumes 25 per cent more air than the American turbojet, a larger intake is required, and this is a distinguishing feature of the CA-27 Sabre.

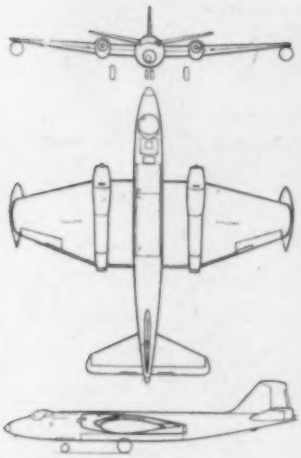
Installation of the Avon farther aft to counteract the engine weight difference (being some 400 lb lighter than the J47) resulted in 60 per cent of the Sabre's fuselage being completely redesigned by Commonwealth Aircraft. In addition, Australian Sabres are armed with two 30 mm Aden guns in place of the original armament of six 0.50in guns. Provision is made for carrying external war loads of bombs or rockets up to a maximum of 4,000 lb. Although no details of performance have yet been released, the Avon Sabre is known to have a top speed of at least 700 m.p.h.

Above and left, Winjeel.

Below and left, Sabre.

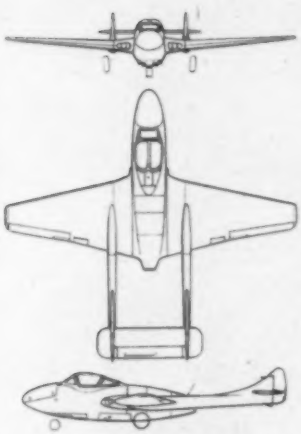
Powerplant	C.A.C.-built Avon 20
Span	37ft 1in
Length	37ft 6in
Gross weight	17,000 lb
Max. speed	700 m.p.h.





Powerplant	...	**C.A.C.-built Avon**
Span	...	63ft 11¼in
Length	...	65ft 6in

Above and left, Canberra B20.



Powerplant	...	**D.H. Goblin 3**
Span	...	38 ft
Length	...	34ft 6in
Gross weight	...	12,390 lb
Max. speed	...	550 m.p.h.

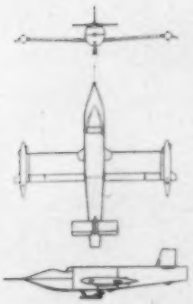
D.A.P. Canberra. The Australian version of the English Electric Canberra bomber—designated B.20 and based on the British-built B.2—now equips two R.A.A.F. bomber squadrons. Production of the aircraft is undertaken for the Defence Department's Division of Aircraft Production in Government aircraft factories, although there is a considerable amount of sub-contracting to private industry—notably for the production of pressings and wing spars. The Australian Canberra has Commonwealth-built Avons and Australian radio, instrumentation and other operational equipment installed.

The first of an initial order for 48 aircraft flew in May 1953, but additional contracts for later versions of the Canberra (for which designations Mk 21-24 inclusive have been reserved) will keep the type in production until 1957. Output is at present geared to the R.A.A.F.'s peace-time requirement for approximately 20 Canberras a year.

de Havilland Vampire. Early next year the Vampire T.33 trainer will be adopted by the R.A.A.F. as its standard advanced trainer. Unlike the single-seat Australian Vampires, the Trainers are powered by imported Goblins, as employed in all British-built versions. Production of the T.33 (the Australian designation of the Vampire T.11) is likely to continue for the next two or three years—about 100 will ultimately be built.

D.A.P. Jindivik. Designed to a Ministry of Supply specification, the Jindivik I pilotless jet target aircraft made its first flight in August 1952, powered by an Armstrong Siddeley Adder turbojet. A later design powered with a 1640 lb s.t. Viper engine and designated Mk 2, underwent its first trials in December 1953. Aerodynamically based upon the Mk 1, the Jindivik 2 has a larger intake to accommodate the increased mass flow, and changes have been made to the wing thickness and to the rear fuselage lines. Constructed from the lower alloy grades of aluminium, the Jindivik is engineered to avoid the use of forgings, extrusions and machined fittings. The fuselage is built in four main sections—front fuselage, equipment bay canopy, centre fuselage and rear fuselage.

Centre G.A. drawing, Vampire. Below, Jindivik.



Powerplant	...	**Armstrong Siddeley Viper**
Span	...	21 ft
Length	...	23ft 3½in

Above and right, CF-100 Mk 5.

Powerplant ...	... Two Orenda 11
Span	... 56ft (less pods)
Length ...	... ... 54ft
Gross weight	... about 37,000 lb
Max. speed ...	about 660 m.p.h.

Commonwealth Aviation — CANADA

Avro CF-100. Latest variant of the CF-100 long range all-weather day and night fighter is the Mk 5, a high altitude version which can be distinguished by its increased span—parallel chord extensions three feet long have been added to each wing tip, and the tailplane span has been increased as well. In order to attain a very high altitude performance—the operational ceiling is claimed to be over 50,000 feet—the ventral gun or rocket pack has been removed.

Apart from the Avon-powered prototype aircraft, Canadian Orenda turbojets have been used in all marks of the CF-100. The first series to be built in large numbers was the Mk 3 armed with eight 0.5in guns—these are now trainer versions, designated Mk 3T. An important variant now in service is the Mk 4, which carries its main armament of 104 air-to-air rockets (or a lesser number of guided missiles) in wing-tip pods, although provision is made for a ventral gun or rocket pack as fitted to the Mk 3. The Mk 4 order for 510 aircraft is now complete, and the Mk 5, ninth version to be built since the prototype flew in January 1950, is now in production.

The makers claim that the CF-100 is one of the best all-weather operational fighters in the world. This is substantiated by performance figures quoting the range (with wing-tip tanks) as being in excess of 2,000 miles, with an endurance of over five hours at altitudes above 45,000ft. The aircraft is known to be capable of exceeding Mach 1 in a dive.

CF-105. Expected to fly next year, the CF-105 will be a two-seater of acute delta configuration. The first few aircraft will be powered with two J75 turbojets, but later aircraft will employ integral after-burning Iroquois engines delivering a total thrust approaching 60,000 lb.

Described as "virtually automatic," the CF-105 should be capable of interception at Mach 2 in all weathers, armed with air-to-air guided missiles. Work on the prototype is progressing.

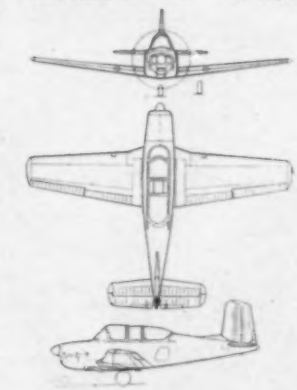
CanCar T-34A. The last of an order for 125 Beechcraft T-34A primary trainers has now been completed. Designed to fulfil the same rôle as the Harvard, but at lower cost, the aircraft was developed from the Bonanza and is known as the Mentor. Construction in Canada was undertaken in 1953 by the Canadian Car and Foundry Co., who built 100 aircraft for the U.S.A.F. and the remainder for the R.C.A.F. Powered by a 225 h.p. Continental, the Mentor is of all-metal construction and features a retractable tricycle undercarriage and steerable nosewheel. The Mentor is now in service in the U.S.A.F. and U.S.N., Chile, Colombia and Japan.

Canadair CL-28. The largest aircraft ever to be built in Canada, the CL-28 is a much-modified version of the Britannia. The fuselage in particular has been completely redesigned by Canadair for low level "submarine detection and attack" and is no longer pressurized. In order to provide 24-hour endurance at all altitudes, the powerplant installation and nacelles have been redesigned to accommodate Wright Turbo-Compound piston engines in place of the Proteus Turboprops.

Manned by a crew of 15, the aircraft will carry a variety of armament in its two weapons bays and 21 different radio and radar installations. Beneath the glazed observation station in the nose there will be a large radome, and the installation in the extreme tail of a magnetic airborne detector boom will increase the fuselage length from 114 to 122ft. Firm orders for 25 aircraft for the R.C.A.F. have been placed. First deliveries are expected in early 1957.

CL-44. For some while, Canadair have been studying a military transport and command version of the CL-28, designated CL-44. The aircraft will be pressurized and turboprop powered. Bristol Proteus, Orion, or Rolls-Royce Tyne engines are alternatives under consideration.

Powerplant ...	Continental O-470-13
Span	... 32ft 10in
Length ...	... 25ft 10in
Gross weight	... 2,900 lb.
Max. speed ...	190 m.p.h.



Above, T-34 Mentor.
Below and left, CL-28.

Powerplant ...	Four Wright Turbo-Compound
Span	... 142ft
Length ...	... 122ft
Gross weight	... 150,000 lb
Max. speed ...	350 m.p.h.

The Westland

WIDGEON

AMBULANCE VERSION

The design of the Widgeon makes provision for its immediate use as an ambulance without any modification whatsoever. To convert a passenger-carrying version for ambulance duties, all that is necessary is to remove the triple rear seat and transfer the port side front seat to a position behind the pilot for use by a medical attendant. As will be seen from the illustration, accommodation is provided for two stretchers, one above the other, positioned lengthways in the cabin.

They are loaded through a clam door on the port side of the nose and held firmly in position by inserting the carrying handles into holes provided in the rear wall of the cabin and by slings forward of it.

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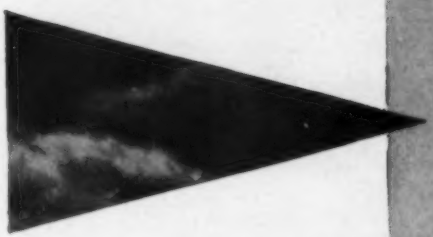

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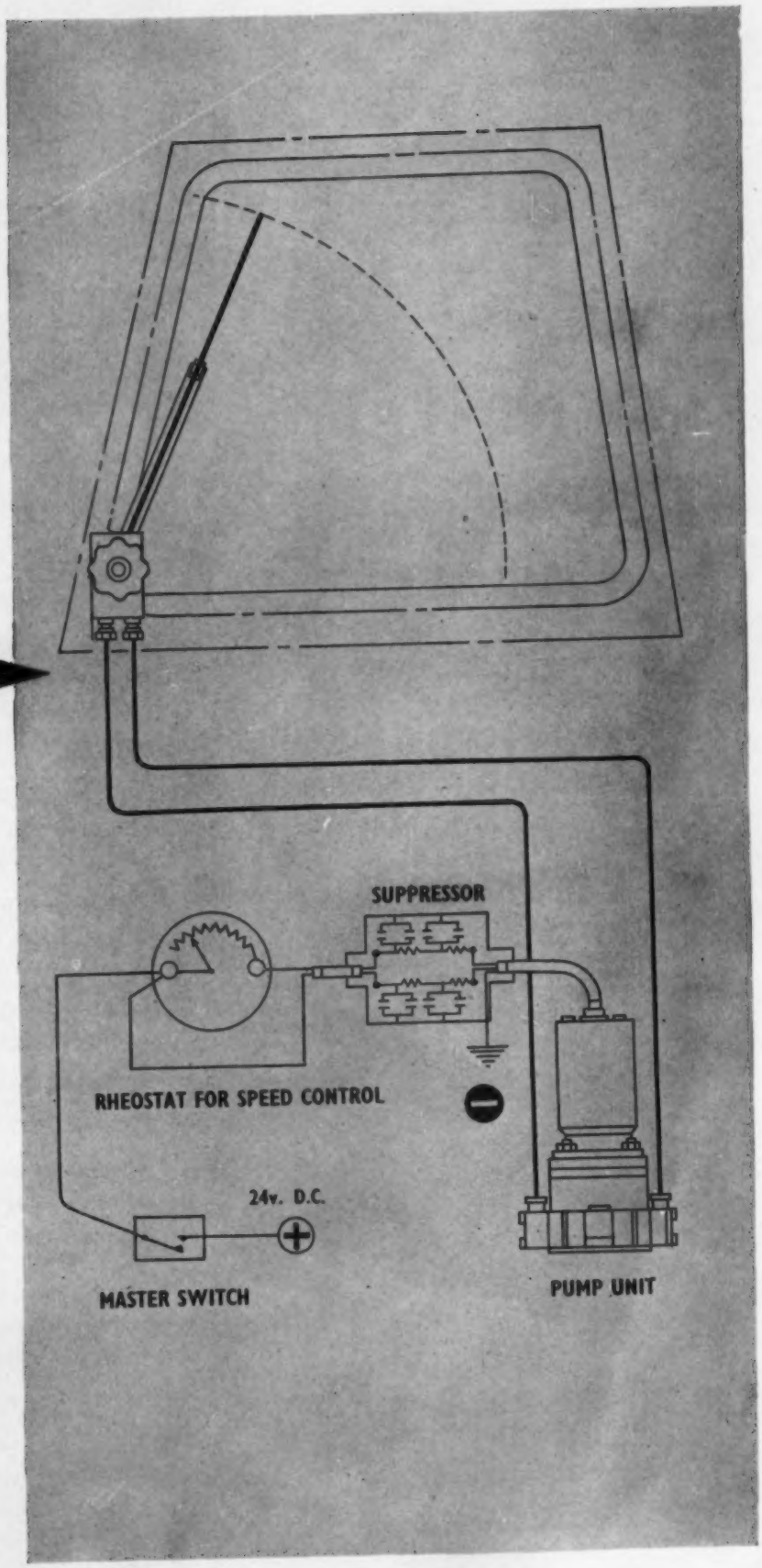
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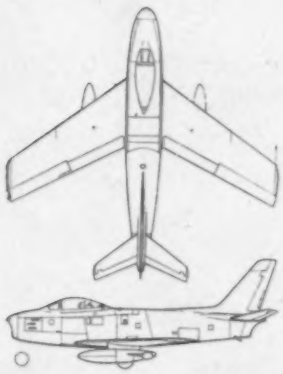
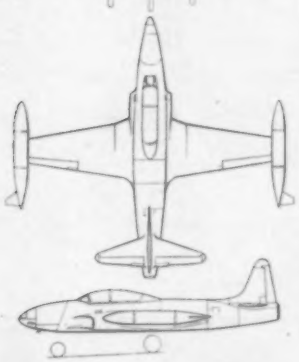
aircraft equipment

A815

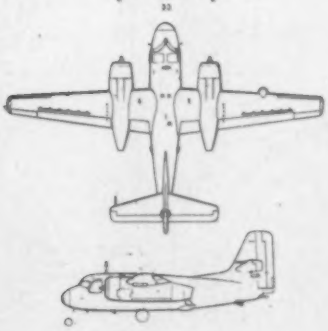
Powerplant ...	**Orenda 14**
Span	37ft 1in
Length	37ft 6in
Gross weight ...	16,000 lb
Max. speed ...	about 690 m.p.h.

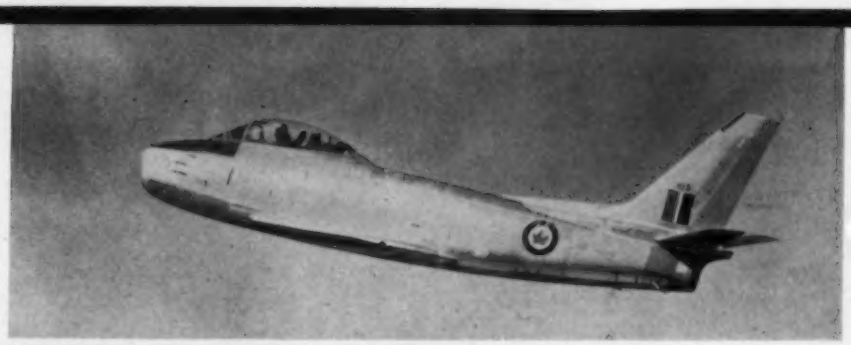


Powerplant ...	**R.R. Canada Nene 10**
Span	38ft 10½in
Length	37ft 9in
Gross weight ...	about 12,000 lb
Max. speed	600 m.p.h.



Powerplant ...	**Two Wright R-1820**
Span	69ft 8in
Length	42ft 3in
Cruising speed ...	150 m.p.h.





Above and left, Canadair Sabre. Below, T-33 Silver Star.

Commonwealth Aviation

Canadair Sabre. Since 1950 about 1,600 F-86 Sabres have been built by Canadair—227 of them in 1955. Half the total production has been Orenda powered. The current version, the Sabre 6, is a hybrid version of the F-86E, incorporating features (such as the "hard" leading edge) of the F-86F, and is powered by the Orenda 14 two-stage turbine engine. Last year, an "area rule" experiment was carried out on the Sabre by bulging each side of the fuselage fore and aft of the wing, and the aircraft is being tested by the R.C.A.F. and National Aeronautical Establishment (see photograph on page 285).

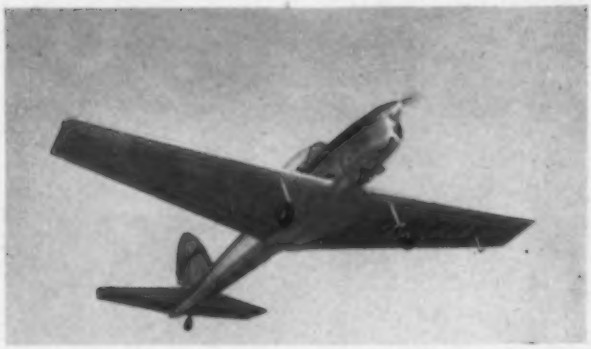
Canadair-built Sabres, armed with the standard American equipment of six 0.5in guns and able to carry 4,000 lb of bombs or rockets externally, are in service with the R.C.A.F., R.A.F., S.A.A.F. and U.S.A.F., as well as the air forces of France, Turkey, Greece and Colombia.

Canadair Silver Star. Since late in 1952, when deliveries of the Canadair-built version commenced, 550 T-33AN Silver Stars have been built. Powered by a Rolls-Royce Nene 10 offering an all-round improvement in performance, the Canadair T-33AN is basically similar to the Lockheed T-33, a two-seat training version of the Lockheed F-80 Shooting Star. Production of the aircraft is expected to continue for some time, probably until some decision is reached regarding a basic jet trainer for the R.C.A.F. The T-33AN is the standard jet trainer for pilots of the R.C.A.F. in Canada and Europe and for all Canadian-trained N.A.T.O. pilots.

de Havilland CS2F-1. The Royal Canadian Navy have chosen the Grumman CS2F-1 to be the backbone of their anti-submarine air power. Widely subcontracted throughout the Canadian industry, de Havilland Aircraft of Canada (who are the "prime contractors") are responsible for assembly, equipment installation and testing at their Toronto factory, and are themselves building the first 42 front-fuselage units. R.C.N. orders have been placed for 66 aircraft, with spares provisioning for 100. The first two aircraft have flown, and are expected to be delivered to the Navy in September.

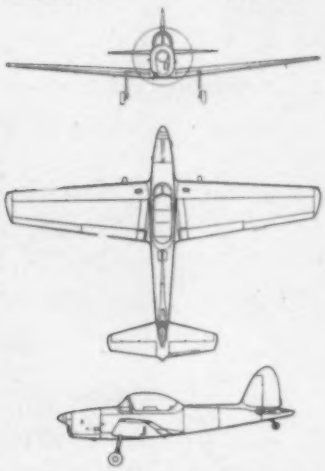
The CS2F-1 is a multi-purpose aircraft equipped with homing torpedoes, rockets, depth charges and mines for its primary rôle of submarine attack. Search aids include radar, electronic counter-measures, magnetic detectors, searchlight and sonobuoys. Powered by two Canadian-built Wright Cyclones and carrying a crew of four, the aircraft has an endurance of 8 hours, and a search speed of 130 knots. A take-off run quoted as slightly over 300ft and an approach speed of 75 knots enable the CS2F-1 to operate from light fleet carriers without rocket or catapult assistance—a major factor behind its selection for the R.C.N.

Below and left, CS2F-1.



Right, Chipmunk.

Powerplant ...	DH Gipsy Major 1c
Span	34ft 4in
Length	25ft 5in
Gross weight	1,930 lb
Max. speed	130 m.p.h.



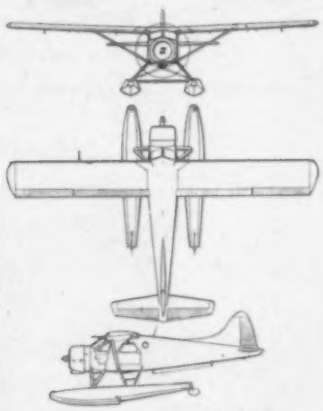
Commonwealth Aviation

de Havilland Chipmunk. Production of the DHC-1 Chipmunk in Canada was resumed in 1955 with the re-introduction of two-stage basic training in the R.C.A.F. Of the 60 ordered at that time, over 40 have been delivered. One of the most successful post-war light trainers, a total of over a thousand Chipmunks was built in England by the parent company for the R.A.F. and a number of foreign air forces. The Canadian factory produced 158 aircraft between 1946 and 1951. In contrast to the Gipsy Major 10 of the British-built Chipmunk T.10, the Canadian version is powered by a Gipsy Major 1c engine; other differences include a frameless bubble canopy and variations in the instruments and equipment. At least one Canadian aircraft has been re-engined with an American flat-four.

de Havilland Beaver. It happens only rarely that the military version of an aircraft will outsell its civil counterpart, but supplies of the L-20 Beaver to the United States Army and Air Force have accounted for over 600 of about 1,000 that have been built . The Beaver virtues of strength, simplicity and reliability in its rôles as an eight-seater outback airliner, freighter, ambulance, fire-fighter, power line patroller and agricultural worker have extended its field of operations to over 50 different countries. The Beaver can operate from land, water or snow, using wheel, float or ski undercarriages. Amphibious floats and two types of wheel-skis are available. Capable of operating from strips of less than 200 yd length, the Beaver will lift well over half a ton of payload and can cover distances of up to 1,000 miles. A variety of external stores can be carried, which may be dropped either individually or simultaneously.

de Havilland Otter. Although the Otter, with capacity for up to 14 passengers or over a ton of cargo, is a larger aircraft than the Beaver, it conforms to the same formula, and was designed for rugged outback-operation. For some time now Otters have been approved for operation at 7,600 lb all-up-weight, and the normal range is 1,000 miles. Powered by a 600 h.p. Pratt and Whitney Wasp, the Otter (like the Beaver) flies from 200 yd strips; the stalling speed is only 45 m.p.h. Float, wheel, or wheel-ski undercarriage combinations are used to extend the aircraft's operational capabilities, and the 345 cu ft cabin is fitted with loading doors which are nearly 4ft square. Over 150 Otters have now been delivered to military and civil operators. The largest customers are the U.S. Army and Navy who have ordered 102. The first aircraft for a U.S. civil operator—an 11-seater seaplane—has recently been delivered.

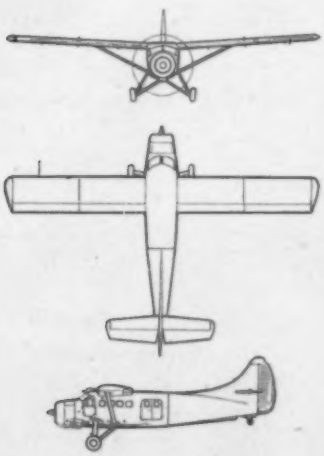
Powerplant ...	Pratt and Whitney R-985
Span	48ft
Length	30ft 4in
Gross weight	4,820 lb
Max. speed	164 m.p.h.

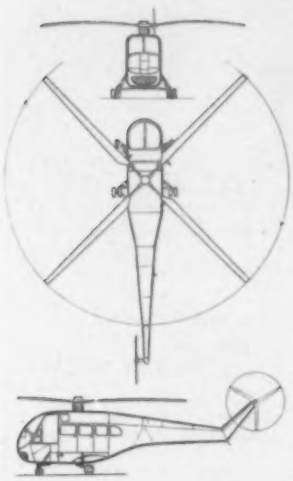


Right, Beaver.

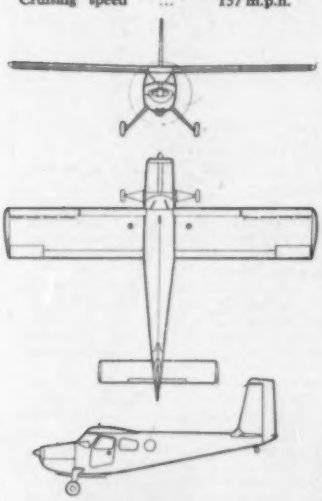
Below and right, Otter

Powerplant ...	Pratt and Whitney R-1340
Span	58ft
Length	41ft 10in
Gross weight	7,600 lb
Max. speed	160 m.p.h.



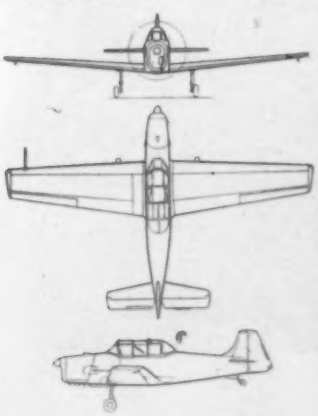


Powerplant ...	**Lycoming SO-580-D**
Rotor diameter	48ft
Length	38ft
Gross weight	5,000 lb
Max. speed	98 m.p.h.



Powerplant ...	**Lycoming 260 h.p.**
Span	39ft
Length	30ft
Gross weight	2,800 lb
Cruising speed ...	157 m.p.h.

INDIA



Powerplant ...	**Cirrus Major 3**
Span	35ft 2in
Length	25ft 3in
Gross weight	2,240 lb
Max. speed	130 m.p.h.

Above and left, LZ-5 and Courier.

Doman-Fleet LZ-5. The first helicopter to go into production in Canada, the Doman-Fleet LZ-5, is an attempt to capture the promising Canadian commercial market for helicopters, as well as fairly substantial R.C.A.F. and R.N. orders which are in the offing. Series production is being started now that the helicopter has been granted its Canadian C. of A.

Of apparently orthodox layout, the LZ-5 embodies an unconventional hingeless four-blade main-rotor system. Inclination of the top-path plane of the rotor relative to the fuselage is accomplished by gimbal-mounting the rotor hub. Powered by a 400 h.p. air-cooled Lycoming, the LZ-5 accommodates a pilot and up to six passengers. The parent Doman company, of Connecticut, U.S.A., has delivered a number of LZ-5s to the U.S. Army for service trials.

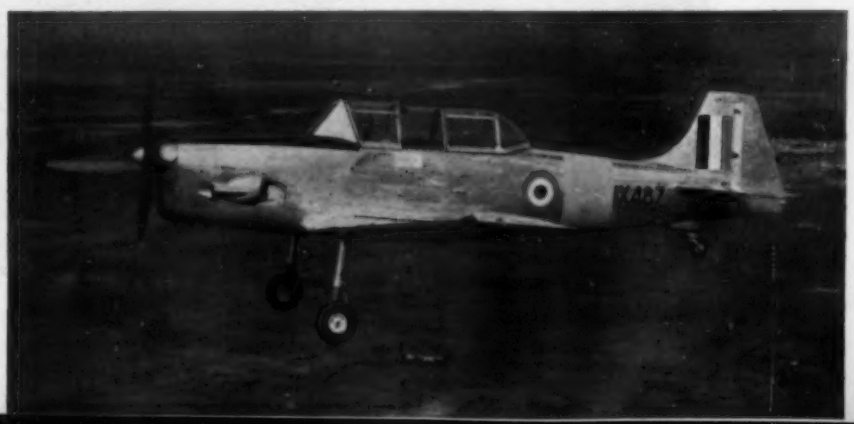
Fleet Courier. The Courier is manufactured in Canada under licence from the U.S. Helio Aircraft Corporation; and Fleet Manufacturing, Ltd., hold all the production and sales rights for the Commonwealth. This aircraft is the third of the Helioplane series, and was designed to combine some of the advantages of the helicopter with the high cruising speed and long range associated with fixed-wing aircraft. The Courier is claimed to overcome what its sponsors regard as being the chief objections to the increase of private flying—the "technical know-how" to be mastered by the average lightplane pilot, and insufficient operational safety. By means of full-span slots and wide slotted flaps the Courier can be flown under full control at 27 m.p.h., and is virtually stall and spin-proof. Powered by a 260 h.p. Lycoming, an 18 deg climb angle and a 160 m.p.h. cruising speed can be achieved. Other special features are mainwheels which are placed so far forward that nosing-over is virtually impossible, and the lack of a tailplane—the complete horizontal tail surface (which is fitted with an anti-balance tab) is movable.

Hindustan HT-2. The first aircraft to be designed and produced in quantity in India, the HT-2 is an efficient basic trainer powered by a 155 h.p. Cirrus Major III engine. Batch delivery is now being made to the Indian Air Force, and the Director General of Civil Aviation has placed an initial order. A tour of East Asian countries has recently been made in order to demonstrate the HT-2 to various national air forces and flying clubs. Visitors to Bangalore have also commented favourably upon the handling qualities and aerobatic performance.

The HT-2 is of all metal construction and has a cruising speed of 115 m.p.h. Stalling speed with 30 deg flap is 47 m.p.h., and the initial rate of climb is 800ft/min. Endurance, on 26 gal, is about 3½ hr. Future projects to be undertaken under Dr. Ghatage, the chief designer, include a jet trainer and advanced jet fighters.

de Havilland Vampire. Goblin powered Vampire two-seat trainers, built by Hindustan Aircraft, are being supplied to the Indian Air Force. Designated Mk 55, these aircraft are an export version of the Vampire T.11 trainer. Production of 50 machines has been undertaken.

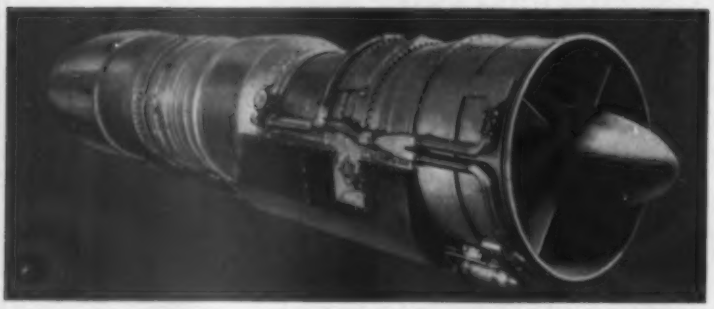
Below, HT-2.



AIRCRAFT OF THE COMMONWEALTH — 1956

	Power Unit(s)			Span (ft)	Length (ft)	Gross Weight (lb)	Max. Speed (m.p.h.)	Typical Load or Operational Equipment	Remarks
	No.	Type	Total power *						
AUSTRALIA									
D.A.P. Canberra B.20	2	C.A.C. Avon ...	13,000	64	66	—	—	As for R.A.F. B.2.	In production. Many in service.
D.A.P. Jindivik 2 ...	1	A.S.M. Viper ...	1,900	19	23	—	—	Radio-governed autopilot	In production. High subsonic speed.
CA-22 Winjeel ...	1	P & W R-985 ...	455	39	29	4,235	187	Three seats, 72 gal. fuel	Deliveries in progress; 62 on order.
CA-27 Sabre	1	C.A.C. Avon 20 ...	8,000	37	38	17,000	700	Two 30 mm Aden guns plus 4,000 lb stores on underwing racks.	Deliveries in progress. At least 90 on order; many in service.
D.H. Vampire T.33 ...	1	D.H. Goblin 3 ...	3,500	38	34	12,390	550	20 mm guns, plus 1,000 lb underwing load.	In production. At least 36 on order.
Fairey Firefly T.5 ...	1	R-R Griffon 74 ...	2,020	41	38	12,000	360	Four 20 mm guns plus underwing stores.	Conversion of British-built Firefly A.S.S. Limited production.
CANADA									
Avro Aircraft CF-100-4	2	Orenda 11 ...	15,000	50	54	37,000†	660	104 rockets and eight 0.5 guns.	Order for 510 completed.
Avro Aircraft CF-100-5	2	Orenda	16,000	56	54	35,500	675	104 rockets	In production.
Avro Aircraft CF-105	2	Iroquois	40,000†	—	—	56,000†	M=2†	Guided weapons.	Production contract; prototype expected to fly in 1957. Will have delta wing.
Canadair C-4 ...	4	R-R Merlin 720-6 ...	7,040	117	94	82,300	320	About 15,000 lb or 40 seats	72 built, civil version pressurized.
Canadair C-5 ...	4	P & W R-2800 ...	9,000	117	94	86,000	340	About 18,000 lb.	One only. V.I.P. transport.
Canadair Sabre 4 ...	1	J47-GE-27	5,800	37	38	16,000	670	Six 0.5in guns.	Total of over 1,500 built. Sabre 6 currently in production.
Canadair Sabre 6 ...	1	Orenda 14	8,000	37	38	16,000	690	Six 0.5in guns. Underwing stores.	
Canadair Silver Star (T-33AN)	1	R-R Nene 10 ...	5,100	36	38	12,000	600	Two 0.5in guns. Two seats.	In production; over 500 delivered.
Canadair CL-28 ...	4	Wright R-3350 ...	14,800	142	122	150,000	350	Various offensive stores internally.	Development of Britannia. First CL-28 to fly in January.
Canadair CL-44 ...	4	R-R Tyne	18,000	142	125	175,000	450	As Britannia.	Military transport project. May have Proteus or Orion engines.
CanCar Harvard 4 ...	1	P & W R-1340 ...	550	42	30	5,617	210	Two seats.	550 built since 1945, production now complete.
CanCar Mentor ... (Beech T-34A)	1	Continental O-470	225	33	26	2,900	190	Two seats. Radio.	Production of 125 (100 for U.S.A.F., 25 for R.C.A.F.) complete.
D.H.C.1 Chipmunk ...	1	Gipsy Major 1c ...	140	34	25	1,900	139	Two seats. 742 lb disposable.	Total of 158 built; about 1,000 more from U.K. Production now restarted.
D.H.C.2 Beaver ...	1*	P & W R-985 ...	450	48	30	4,820	164	Up to seven seats.	In production; about 1,000 delivered.
D.H.C.3 Otter ...	1	P & W R-1340 ...	600	58	42	7,600	160	Up to 17 seats.	In production; about 160 delivered.
D.H.C.4	2	R-1340	1,200	85†	50†	20,000†	175†	About 30 seats.	Project.
D.H.-built CS2F ... (Grumman design)	2	Wright R-1820 ...	3,000	70	42	—	—	Four seats, weapons and radar.	Deliveries starting, D.H. being "prime contractor."
Fleet-built Courier ...	1	Lycoming	260	39	30	2,800	170	900 lb (agricultural 1,600).	Licence from Helio Aircraft Corp. Agricultural weight 3,500 lb.
Doman-Fleet LZ-5 ...	1	Lycoming SO-580D	400	48‡	38‡	5,000	98	2,140 lb or six passengers.	Licence from Doman Helicopters, Inc.
INDIA									
Hindustan HT-2 ...	1	Cirrus Major III ...	155	35	25	2,240	130	Two seats. Radio optional.	In production for I.A.F. Available for export.
Hindustan HT-10 ...	1	P & W R-1830 ...	1,050	44	33	8,500	230†	Two seats side-by-side.	Prototype being built.

* *Pounds thrust or horsepower;* † *Estimated value;* ‡ *Rotor diameter and fuselage length.*



Orenda Engines PS-13 Iroquois (mock-up).

COMMONWEALTH AVIATION

The Engines

AS in previous years, by far the most important aero-engine company in the British Commonwealth is Orenda Engines, Ltd., of Toronto, Canada (page 300). Originally it was the gas turbine division of A. V. Roe, Canada, Ltd., and its work is centred at an 800,000-sq ft plant at Malton, near Toronto.

The Orenda is a single-shaft turbojet which in its earliest versions employed a ten-stage compressor, six large tubular combustion chambers and a single-stage turbine. Several hundred such engines were delivered for the Avro CF-100 and Canadair Sabre, weighing about 2,700 lb and rated at approximately 5,800 lb thrust.

During the past two years the Orenda 11 and 14, with a two-stage turbine, have gone into production. Although considerably more powerful, these engines are no longer than their predecessors and are lighter by some 140-150 lb. Deliveries of the Orenda 11 for the CF-100-4 began in April 1954. The guaranteed thrust of this version is 7,000 lb with a j.p.t. of 690 deg C and a weight of about 2,405 lb. In the Orenda 14 the j.p.t. is set at 715 deg C to give increased thrust. Deliveries of these engines for the Sabre 6 began in September 1954. More than 3,000 Orendas have now been delivered and production is proceeding steadily at a reduced rate of approximately 25 per month. Each engine costs some £23,200, which is most competitive.

Orenda's future rests on what may well be the largest and most powerful aero-engine in the world, the turbojet named Iroquois, which began life with the works designation PS-13 (Project Study 13). Work began on this engine in 1953 as a private venture, but it is now in receipt of extensive government support as the powerplant for the forthcoming CF-105.

The accompanying photograph depicts a mock-up of this mighty engine. It is of the two-spool configuration with a design pressure ratio of approximately 8:1, which is a good optimum figure for supersonic operation. Other visible features are the annular combustion system, the tank of accessories under the compressor and the hot-air de-icing pipes. The engine has been designed for a dry thrust of at least 20,000 lb and will give a rating approaching 30,000 lb with a special lightweight Marquardt afterburner. Orenda's associates, Canadian Steel Improvement, are supplying titanium for major portions of the Iroquois. To show the weight-saving that this is making possible, it has been estimated that, whereas steel compressor blades for a particular stage would weigh 29 lb and require a steel disc weighing 48 lb, titanium blades for the same stage would weigh 17 lb and require only a 16-lb disc. The dry weight of the engine is hoped not to exceed 4,000 lb, which gives an indication of the exceedingly advanced design of the unit.

Bench running started in the winter of 1954-55, by which time Avro had spent £1.43m on the engine. Last November the Iroquois was reported to have completed 140 hr and an initial 55-hr test was run earlier this year. Elsewhere in this issue is published an artist's impression of the unique experimental installation of the Iroquois at the tail of a B-47 test bed.

The only other aero engine of Commonwealth design is the small piston engine named Cicada produced by the Commonwealth Aircraft Corporation of Melbourne, Australia. Apart from having only seven cylinders, the Cicada is essentially similar to the Pratt and Whitney R-985 Wasp Junior. The airscrew is driven through a gearbox which places the splined shaft slightly above the horizontal centre-line. After having been fully developed during 1952-5, the design has been placed in reserve for future production as required.

The other major engine programmes of the Commonwealth are described under the relevant company headings elsewhere in this issue. They comprise the following: mass-production of various types of Rolls-Royce Avon by Commonwealth Aircraft in Melbourne; mass-production (recently completed) of the Nene 10 by Rolls-Royce of Canada; and production of the Pratt and Whitney R-1340 and Wright R-1820 by Canadian Pratt and Whitney Aircraft.

Versatile Hawker Hunter

Tests now in progress with the Fairy Fireflash, the new air-to-air guided missile, are adding still further to the Hunter's operational versatility. Readily adaptable for either high altitude interception, low level close support or ground attack duties, the Hunter is the standard fighter of the Royal Air Force and NATO Defence Forces.

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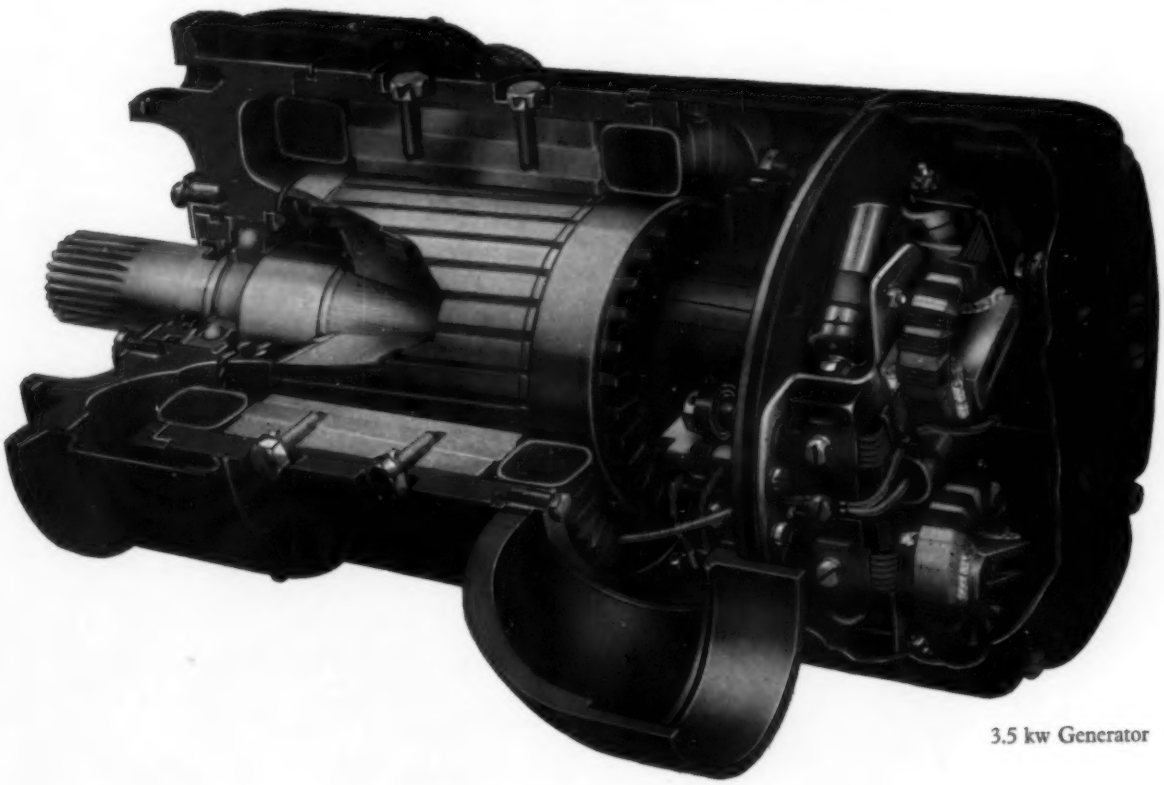
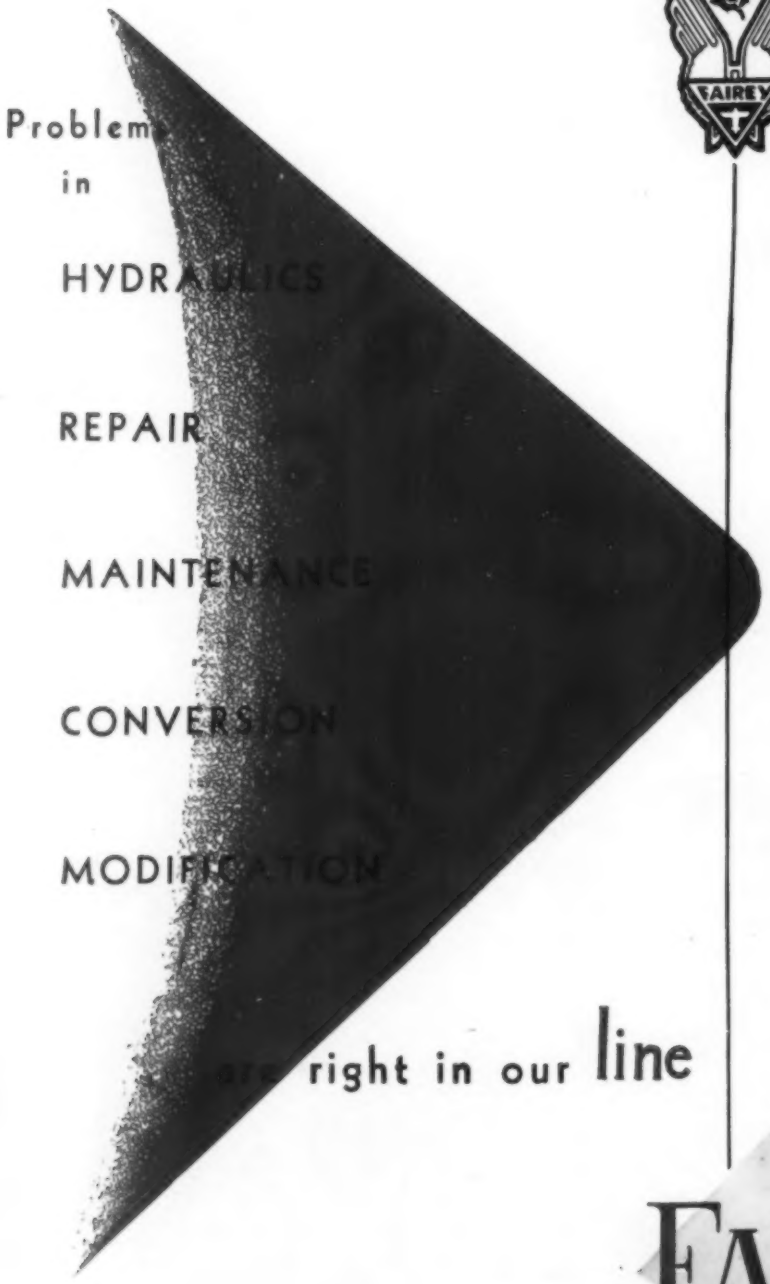
D Type Pump

LUCAS ROTAX



3.5 kw Generator



Problems in

HYDRAULICS

REPAIR

MAINTENANCE

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are right in our line

FAIREY

AVIATION COMPANY OF CANADA LTD.

PATRICIA BAY, B.C.

EASTERN PASSAGE, N.S.

NORTHERN ROUTE

—*From Vancouver to Amsterdam: Impressions of Canadian Pacific Air Lines' Over-the-top Service*

BY KENNETH OWEN

TWENTY-FOUR hours in Vancouver is too short a time. This was my main reflection as Canadian Pacific's DC-6B *Empress of Toronto* taxied out from Gate 6 and across the apron. Ahead of us was the novel prospect of a polar-route flight to Europe, while behind me was a honeymoon couple and the memory of a day-short glimpse of Canada's sparkling west coast.

I had arrived in Vancouver the previous morning by T.C.A. Viscount from Edmonton, which may not have been the most picturesque way to cross the Rockies, but was certainly the fastest and most comfortable. Much of that day I had spent at the airport, soon absorbing its unique atmosphere of expanding and varied activity. I had watched DC-3s, Cansos and Convairs leaving for places with names such as Kitimat, Uranium City, Yellowknife and Flin Flon; and I had sensed the airport's international significance as a real cross-roads of Commonwealth aviation.

Of the various operators and associated companies which jostle each other for space on Vancouver's airport, Canadian Pacific Air Lines are the largest. The airline's headquarters and main base are here, occupying some 300,000 sq ft. Prior to the introduction of the Vancouver-Amsterdam service, C.P.A.L.'s trans-Pacific route from Sydney *via* Auckland, Fiji and Hawaii was well established, and part of the popularity of the northern route has been due to the fact that it completes a fast and convenient network linking Australia, New Zealand and Canada with Europe and the United Kingdom. A much publicized if dubious distinction for passengers on this route is their ability to cross the Equator, the International Date Line and the Arctic Circle on one and the same service, and within four days. The company's other main inter-continental service, intersecting this route at Vancouver, is from Hong Kong and Tokyo to Mexico City, Lima and Buenos Aires.

My first contact with the direct planning of our flight from Vancouver to Amsterdam was at 11.30 on the morning of the flight, two hours before take-off, when I joined the crew for their detailed met. briefing. The assembling of weather information for the flight had begun much earlier, however—at about 2 a.m. —when special upper-air charts had been prepared in the airport's met. section. The C.P.A.L. flight dispatcher had checked with met. a few hours later, and had prepared provisional routings in the form of a pre-plan; using the forecast wind-components at various altitudes he had calculated times and fuel consumptions at various engine powers. From the pre-plan, the captain had obtained a general picture of the probable effect of weather conditions on the flight, before discussing the later weather information at the 11.30 briefing.

A first look at the charts indicated some doubt that we would be able to reach Sondrestrom Fiord, Greenland (the only normally scheduled stop between Vancouver and Amsterdam) in one hop. Although there would be tailwinds in the early part of the flight, followed by southerly crosswinds, critical easterly headwinds in the later section were forecast.

After a half-hour session with the met. man, during which the various alternative routes were discussed, the crew returned to the dispatch office at C.P.A.L. headquarters for detailed flight planning. The range and fuel consumption for given headwind components were noted and related to the forecast winds, the effect of cruising altitude was considered, and meanwhile an accurate check of freight, baggage and passenger weights was being made to determine the final permissible fuel load.

The captain of the aircraft on this trip was to be Capt. Ralph B. Leslie who, just one year earlier, had flown the inaugural service of this same route. Previously chief pilot of the Sydney-Armsterdam sector, Capt. Leslie had also been responsible for much of the preliminary flying and planning in connection with the opening of the new route. First officer was Ted Randall, one of a C.P.A.L. family (his father and brother are also pilots) who—despite the earnest efforts of the airline's publicity department—had never yet flown all three together in the same crew.

Listed as second officer on the crew list was Capt. Bill Roxborough, a check pilot who was making a familiarization flight on the northern route for the first time. Completing the flight crew—and doing most of the work in the flight-planning phase—were the two navigators, Bill Douthwaite and Bill McLean.

The final permissible fuel figure was 31,800 lb, 400 lb more than had initially been estimated, and Capt. Leslie decided to flight-plan to Sondrestrom direct, with Frobisher as alternate. One of two power techniques could be used: long-range economical cruise (normally used on flights of more than 12 hours' duration); or combination power, which meant beginning the flight at 1,240 h.p. and cutting down to 1,100 h.p. after four hours' flying. The distance to Sondrestrom was some 2,700 miles.

It was decided to employ combination power. An easterly leg was to be flown across the Rockies to East Princeton, after which we would set course—the Great Circle course—direct for Sondrestrom, which would take us north of Edmonton. The leg to Sondrestrom, it was finally calculated, would take 10 hr 37 min.

From Capt. Leslie I heard brief details of the special techniques used on the northern route. The basic navigational problems, he explained, were caused by the unreliable magnetic area in the region of the North Magnetic Pole (a region extending to a radius of over 1,000 miles); and in the convergence of the meridians towards the Pole in the high latitudes. Ordinary magnetic compasses and conventional map projections are of little use in flying accurate long-range routes in these areas.

The answer to these problems had been found in the use of a directional gyro with a very small rate of random drift, together with the adoption of the Greenwich Grid chart system (in which headings given in grid degrees remain constant throughout a Great Circle route). Canadian Pacific, in common with S.A.S., the other northern-route operator, use the Bendix polar-path gyro, which is fitted with a high-latitude compensator.

Having filed the flight plan with the flight dispatcher, we moved back across to the terminal block, where I left the crew to complete their pre-flight formalities, and went to join the other passengers. For many of these Vancouver was simply a night-stop where they had landed the previous midnight, having boarded the *Empress of Toronto* at Auckland just three days earlier.

A fair number were starting their journey at Vancouver, however, and these were liberally equipped with eager friends and relatives. There was obviously still some novelty in flying the so-called polar route to Europe—at least for passengers and friends, if not for the crew.

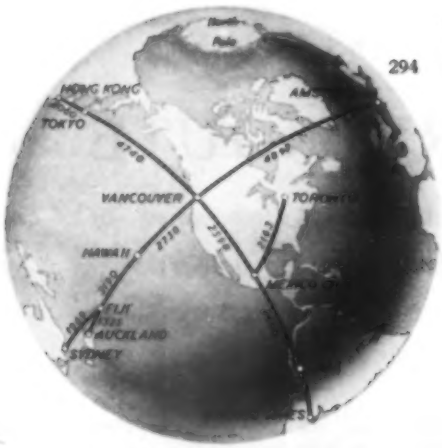
We jostled through the crowd at Gate 6 and boarded the aircraft. The popularity of this service was clearly no myth; 55 out of the 56 seats were filled. Scheduled take-off time was 1.30 p.m., but it was 1.45 before we began to taxi out, and two o'clock when the Pratt and Whitneys were opened up for the take-off run.

We gained height for the easterly leg across the Rockies in a climbing circle out over the bay. This gave us a fresh view of the wide and handsome picture that is Vancouver in its own special setting of mountains, coastline and the Pacific. Soon we had crossed the coastal range and the North Okanagan belt and were approaching the Rockies themselves.

Much of the grandeur of the Rockies scenery was obscured by a mixture of cloud as we crossed the range at 17,000ft, but there remained the striking sight of some of the highest peaks jutting up above the main strato-cumulus layer. Steep islands with snow-covered tops, and smaller lumps on which, it seemed, one might quite easily stub one's toes.

Capt. Leslie spoke over the cabin-address system, apologizing for the take-off delay, which had been caused by a malfunctioning tachometer. He was sorry we could not see more of the Rockies; they were very beautiful at this time of year. We would decrease height to 11,000ft after passing Edmonton, he said, in order to take advantage of more-favourable winds.

A cabin crew of three was carried by the *Empress of Toronto*. There were two stewardesses, Patricia Stobart and Dolores Jordan, and one steward, Leendert van Eijk, whose home is in Amsterdam and who was previously with K.L.M. Soon it was time for them to take orders for drinks before lunch, and to



Left, the inter-continental routes of Canadian Pacific Air Lines. Above, DC-6B "Empress of Toronto" at Sondrestrom, Greenland.

NORTHERN ROUTE . . .

indicate one of the differences between first-class and tourist facilities by dispensing packages of books of matches, embossed with the passenger's name in gold, to the fortunate firsts. One mentally deducted their probable cost from the $204.70 difference in fares on the Vancouver-Amsterdam trip . . .

The confusion of my stomach and mind on this trip began between three and four o'clock Pacific Daylight Time (local time in Vancouver), when a truly magnificent lunch was served. The trick was to lose eight hours between Vancouver and Amsterdam, keeping up a pretence of normal habits the while. To assist matters, footrests and blankets were brought round at five o'clock, just after lunch had ended, and most of the passengers obediently took the hint and went to sleep.

There were, however, a number of exceptions. Across the aisle, oblivious to the atmosphere of rest which pervaded the first-class cabin, an English couple were earnestly discussing serious topics. In the seats behind me was a young Canadian newly married couple, quietly listing their reasons why *their* wedding reception was much better than others they had attended. The girl, I remembered, had approached Jack Crump of C.P.A.L., with whom I had been talking before the flight, to thank him for providing some information several months previously. The young lady had at that time been preparing a College thesis on airline economics—a most unlikely sort of thing to accompany red hair and freckles—and since then she had graduated with a First (hence the gratitude to Mr. Crump) and, the previous day, had got married. The two were now on their way to a two-months honeymoon in Europe.

Across from these two, two separate young women were variously occupied. The window-side one, having surely exhausted her supply of films in recording every aspect of the pre-lunch scenery, was churning out letter-cards at an amazing rate; while her companion, blanketed and footrested, slept eloquently with her mouth open.

Representative of another type of traveller was the middle-aged married couple who sat in front of the two tall and untidy Britishers. For them, it seemed, the flight was complicated. Well-equipped with personal impedimenta—much of it contained in a Braniff Air Lines bag with a Japan Air Lines label—one or the other was invariably moving, adjusting, re-arranging, or displacing either themselves or their belongings in the intervals between restless sleep. They were no beginners in the travel game, though: the wife had declined the six-course *Empress* lunch in favour of two dishes of what looked like asparagus stalks; the husband had swiftly blocked up the ventilation slits with two postcards from the flight pack which said "Welcome"; and at one stage they had the seat-arm off and stacked in their ceaseless quest for peace of mind.

We were now passing over the incredible, interminable lake-spattered expanse of the "Barren lands" of Canada's Northwest Territories, having earlier crossed the flat sweep of the northern prairies. The thousands of small, intricately jigsawed lakes which stretched all around seemed to be patterned on a huge melon-skin surface. More lakes, and more barren marshland. Our first sight of ice came at 6.20 Vancouver time, when some of the lakes to the north were seen to be frozen. Then a hesitant whitening appeared to starboard, too, with a blue-black edging which traced the shores of the larger lakes. A little later, some way above the sixtieth parallel, the scene below was completely white.

This part of the route, approaching within 500 miles of the magnetic pole, is especially susceptible to magnetic errors and discrepancies. Compass errors of over 60 deg have been caused by magnetic bodies on the ground, and the change in magnetic variation over this sector can be from 20 deg west to 60 deg east.

Our aircraft was carrying two independent stand-by gyros in addition to the Bendix polar-path unit. The Bendix and at least one of the others were operating continuously throughout the flight. McLean and Douthwaite were checking the aircraft heading every half-hour by means of astro sights; and astro fixes of our position were being taken every hour. Other navigational facilities—such as Loran, D.R. and radio ranges—were, of course, being used during the flight.

After the astro checks the gyros were not re-set, but their individual rates of precession were noted and used in subsequent adjustments to course. I was told that the precession rate of the Bendix instrument was between one and two degrees per hour.

Following the direct Great Circle track to Sondrestrom, we would by this time have been crossing the great Hudson Bay. We had taken a more northerly course, however, in order to take advantage of better winds, and so were continuing over land towards the north of the bay. "How many times could you fit the British Isles into Hudson Bay?" asked the blonde, tired-looking Englishwoman of her husband. It seemed an excellent question.

Throughout the flight, regular information on the aircraft position, course, alterations of flight plan, and other details were being transmitted back to Vancouver, where our progress was charted in the dispatch office. The flight dispatcher, who had initiated the planning for our flight with his pre-plan early this morning, would now be noting our change of course to the north.

At nine o'clock Vancouver time (midnight local time) Captain Leslie announced that we were passing the northern tip of Southampton Island, which straddles the top of Hudson Bay. We were only 450 miles from the North Magnetic Pole, he reported, and we should cross the Arctic Circle in about 25 minutes. We had then just passed over Roes Welcome Sound, a large stretch of water between the mainland and Southampton Island—and the first stretch of open water since leaving the Pacific. To our left was Repulse Bay.

Empress of Toronto purred on, and below passed wide rolling sandbanks of stratus, tinted a tepid pink by the northern sun, now low on the port horizon. The English couple had begun a new and strange occupation: the wife was filling in a diary, in great day-to-day detail, *beginning three weeks previously*. I could not avoid hearing her intense questioning of her husband. "What time did you leave? . . . How did you come back? . . ."; and, for the fourth of June, a bizarre reply which sounded like "Drove train back, drinking. . . ." That, one thought, must have been quite a day.

At 9.22 Vancouver time (I had decided not to confuse my watch until the last possible moment) came an electrifying announcement. "For your information," Capt. Leslie crisply reported, "we are now crossing the Arctic Circle, at 22 minutes past midnight, local time." Almost with a click everyone's eyes turned to look down at this important boundary but, alas, the dotted line shown on all the maps just wasn't there. The passengers on the starboard side gazed down on a sheet of stratus (which looked just the same as the lower-latitude stuff), and those to port had slightly better value with a glimpse of Foxe Basin (with ice), the channel which separates Baffin Island from the Canadian mainland. The occasion raised a ripple of excited chatter and some smiling nods across the aisle. "What did you do in the evening?" the Englishwoman asked. . . .

Normally, Capt. Leslie explained, the Circle would not be crossed until about an hour and a half later. However, the more-northerly track made good on this occasion would also mean that we would not see the sun set (and rise ten minutes later); instead, it would be with us the whole way—which it was. Just to confuse things further, the moon at that moment began to come up on the starboard side. "Monday afternoon, cocktails. What did you do on Tuesday? . . ."

The sight of the crags, mountains and cliffs of Baffin Island was perhaps the most dramatic of the entire first leg. Topped

by a thick and creamy layer of real snow, in contrast to the icing blobs seen floating in the grey washing-up water of Foxe Basin, the cliffs and valleys were given sharp contrast in the bright sunlight. But beneath the illusion of whipped cream caused by the light-and-shade combination on certain slopes lay the reality of an extremely inhospitable type of country.

At about ten o'clock (this, being Vancouver time, was equivalent to 2 a.m. at Sondrestrom) dinner was served, with the magnificent Baffin Island scenery as an accompaniment. The keen young short-time husband behind me had commented "Just imagine *living* on one of those ice packs . . ." as we had approached the coast; and an equally imaginative attitude was shown by the tall Englishman as he firmly declined his champagne in favour of a can of beer. Steward van Eijk took this very well, and I managed not to choke over my *filet mignon* at the time. To the north, the sun's bright light had softened to glow with a subtle presence on a proud, silent range of peaks.

Discussing the flight with Capt. Leslie, I heard that we were meeting headwinds of 35-40 kt from the top of a low-pressure area. These regions were more normally encountered further south. Our revised E.T.A. at the Greenland base was now 5.15 a.m. local time.

The sun's reflection could now be seen, metallic and cold, on the pack and drift ice which fringed the coast of Baffin Island. Consulted by the young Canadian couple as a relatively experienced Arctic Circle flier (one previous trip to the Lofoten Islands in a Coastal Command Neptune from Kinloss), I was able to confirm that the iceberg-like objects jutting up from the coastal ice were indeed icebergs. The wide background expanse of coastal ice was traced with a fantastic pattern of random lines and areas, presumably as a result of changing pressures and movements. The general effect was something like a gigantic photomicrograph of an etched metallic specimen—or like the patchwork pattern of English fields, entirely white fields with spidery outlines. As we headed out over the Davis Strait towards Greenland, the view below became obscured by cotton-wool ripples of cloud.

Accepting Captain Leslie's invitation to come up front, I found him busily signing 55 Arctic Circle Club cards (denoting a successful crossing of the Circle by each passenger) as I entered the cockpit. Ted Randall was getting some rest, and Capt. Roxborough was in the co-pilot's seat.

From the jump seat in the cockpit I watched the approach to Greenland and Sondrestrom. Our indicated speed and altitude were 200 kt and 11,000ft, the latter decreasing as directed by Sondrestrom Control in stages. Our landfall was made at Holsteinborg, where we turned on to a course on which we would join the fiord of Sondrestrom.

Having intercepted one leg of the base's beacon, we turned again, this time to fly in along the fiord itself—and into the sun. This part of Greenland, at this time of year, was not snow-covered, and presented a rocky brown face to the world. Ahead of us, as we let down along the fiord, could be seen the airstrip —some thirty miles distant. Although conditions were ideal, we had requested a practice G.C.A. approach.

Soon we were literally in the slot, with our wing-tips below the level of the cliff-face on either side, and the straight-in approach was completed with a smooth touchdown at three minutes past five in the morning, local time. The strangely garbed natives who, exchanging weird and unfamiliar cries, shuffled out to greet us, proved to be the U.S.A.F.

While the aircraft was being refuelled, passengers adjourned to the waiting room to quench thirsts, to buy souvenirs, and to post cards (featuring polar bears and Eskimos) to most ends of the world. Quite a number of infants and small children were travelling; they seemed to be among the more assured of the passengers. Also bearing up very well under the circumstances was a nervous young Englishman who was saying to Stewardess Jordan, "Yes, I'm the one who's going home to get married—can't you tell by the worried expression?"

Not waiting to ascertain Miss Jordan's reply, I left the lounge and sampled the fresh air of Sondrestrom. This felt good. The air temperature was a comfortable 64 deg F, and the time was five-thirty in the morning—a unique and distinguished hour for any journalist to be out and conscious. True, back in Vancouver people were just turning in after a big time, or perhaps just going on to Ted's place; while in London the morning rush-hour traffic jam at Vauxhall would be almost over: but these were philosophical thought-toys for others to play with. Such confusions were not for me.

The various U.S.A.F. aircraft on the base, also, were not for me—or so I was informed by the security-minded gentleman with a gun in his belt. I concurred, noting only that the machines comprised a gaggle of flat-footed wheel/ski Dakotas and a B-29. Soon the other passengers were coaxed and coached back to our *Empress*, where I rejoined them; we bade the natives farewell; and taxied out to the runway. One hour at Sondrestrom, Canadian Pacific Air Lines had said, and one hour they meant: we took off at three minutes past six.

Baffin Island: "A thick and creamy layer of real snow. . . ."

Out over the deep-green water of the fiord, and then eastward across the snow-covered inland region and the white-streaked brown-and-grey coastal border. One of my last impressions of Greenland was of the piercing blue of a number of lakes which interrupted the vast white expanse—looking exactly like royal-blue ink blots soaking into a sheet of white blotting-paper. We climbed to 17,000ft on course for Amsterdam, which we expected to reach in 7 hr 15 min. This leg was of 2,200 miles.

From the gap in my notebook between leaving Greenland and eating breakfast I deduce that, while Iceland and the North Atlantic passed below, I slept. I woke to be greeted with the news that, while my watch indicated 11.15 (Sondrestrom time), local time was 3.15 in the afternoon. This was clearly as good a time as any to have breakfast, for in two hours it would be tea-time and we would be landing at Amsterdam. Any confusion this may cause the reader is, I vouch, extremely small beer compared with my own blank bewilderment at the time.

Fifteen minutes later the coast of Scotland came up, and we passed over Prestwick and a range of grey, brown and purple highlands. This countryside soon gave way to a pleasant green patchwork of fields; looking down on it, we shared the blue sky only with some tufts of fair-weather cumulus. We finished breakfast, and it was ten to four. A brace of Hunters swam up to taste the bright afternoon above the scattered clouds, and thoroughly enjoyed themselves in a lively tail-chase to our right.

Our northern-route flight was drawing to a close. Confidently we could now look in the eye the silent paper bags which had faced us all the way from Canada's west coast. "After use, fold toward you" they said. We were now reasonably sure the use would not arise.

At 4.55 the stewardess came round with coats and hats and, after a let-down through a dull and grey overcast over the flat Dutch countryside, we landed at Schiphol at 5.15. Flying time from Vancouver had totalled 18¼ hr while the total elapsed time was only one hour more. For those of us who were going on to London, there remained a two-hour wait for the connecting K.L.M. Convair service, and an hour-and-ten-minute flight. Walking from the airport lounge at Schiphol, I almost collided with a huge mass of Dutch roses, which turned out to be the wedding-bound Englishman with a modest posy for his betrothed. He still had on his worried look, and anxiously sought my reassurance—readily given—concerning the probable reaction of the loved one to his flowers.

(*Concluded on page 297*)

On arrival at Amsterdam (left to right): crew-members Leslie, McLean, Stobart, Randall, Jordan, Douthwaite, Van Eijk, and Roxborough.

A good proportion of the ninety Avon Sabres ordered are now in service with Nos. 3 and 75 Sqns. of No. 78 (Fighter) Wing at Williamtown. With a Rolls-Royce Avon 7 and two 30 mm Aden guns these Sabres are patent day fighters.

A GROWING AIR POWER

The Disposition and Development of the Royal Australian Air Force

WITH a fine history of achievement in World War 2, the Royal Australian Air Force is now once again being built up to become a force to be reckoned with in the South-East Asian area. Its present commitments include three main operational tasks: first, the air defence of the Australian continent, second, the protection of the sea lanes of communication within landplane range of the mainland and third, the provision of task forces to fulfil such air commitments as have been or may be specified in treaties and agreements.

Australia's first line of defence lies in Malaya, so whilst the main force of first-line fighters in the R.A.A.F. are employed in that area, the air defence of the Australian mainland rests primarily on the five Citizen Air Force Squadrons, most of the pilots of which are members of the Reserve engaged for part-time service and training. In recent years three of these squadrons have given up Mustangs in favour of Vampires, and now another squadron has been re-equipped with Meteor 8s. The units are No. 21 (City of Melbourne), No. 22 (City of Sydney), No. 23 (City of Brisbane), No. 24 (City of Adelaide) and No. 25 (City of Perth). No. 22 Sqn. has Meteors and No. 24 Sqn. has Mustangs. Each of these units has a nucleus of Regular officers and a high proportion of Regular ground staff. During week-ends and one two-week period of full-time service each year, the Reservists are engaged almost entirely in operational training, whilst the Regular officers and N.C.O.s also train the Citizen Air Cadets and ground staff required to keep the squadrons fully manned.

Since these units are liable to be redeployed in the event of war, the annual training period includes a mobility exercise in which complete squadrons move from their bases to such places as Manus in the Admiralty Islands, Townsville, or Darwin. Associated with the mainland and task-force fighters is the usual early-warning and G.C.I. network with radar which is now being progressively replaced by modern American equipment.

The maritime commitment is fulfilled by two squadrons, No. 10 at Townsville and No. 11 at Sydney. The former is equipped with Australian-built long-nosed Lincolns which, though not new, are now being progressively fitted with the latest anti-submarine equipment that will make them suitable for the maritime rôle for a number of years to come. No. 11 Squadron has Lockheed P2V-5 Neptunes bought from America. These machines are considered to be excellently suited for their task and are equipped with the most up-to-date anti-submarine search equipment and weapons.

There is, at present, a task force which is being steadily built up and will be based as part of the Commonwealth Strategic Reserve at the new R.A.A.F. station at Butterworth, in Malaya. The airfield is now being built by an R.A.A.F. Airfield Construction Squadron and, at a future date, it will house a bomber wing and a fighter wing, with associated radar and support units. The portion of the task force now serving in Malaya is No. 1 Bomber Squadron, equipped with Lincolns, which has for five years given excellent service in the anti-terrorist campaign. In Australia No. 82 (Bomber) Wing is now being re-equipped and working up with Canberras at Amberley, and in due course one of its two squadrons, Nos. 2 and 6, will probably replace the Lincoln squadron in Malaya so that this unit can return to Australia for re-equipment. Nos. 2 and 6 Sqns. of No. 82 Wing are at present receiving the Canberra Mk 20, about 60 of which are being built in Australia. The training versions are also being used and both differ from their English counterparts, the B.2 and T.4, in certain details of internal equipment and powerplant. Also in Australia is No. 78 (Fighter) Wing, the first units of which will move to Malaya during next year. The wing consists of three squadrons, Nos. 3, 75 and 77, the first of which won fame in the Middle East in World War 2, the second in the South-West Pacific, and the last-named in the more recent Korean conflict. The wing is based at Williamtown and two of its squadrons have now been re-equipped with the Australian Avon Sabre, 90 of which were ordered. The third squadron should be re-equipped in the near future. The Avon Sabre has completed intensive trials at Williamtown and Darwin and now the experienced personnel of the trials unit have been absorbed into the squadrons of the Sabre Wing. Williamtown is also the location of the R.A.A.F. fighter operational training unit.

Air transport is provided by No. 86 (Transport) Wing, based near Canberra, which consists of Nos. 36 and 38 Squadrons operating about 20 Dakotas between them. Two Convair 440 Metropolitans were recently added as V.I.P. transports.

Base squadrons and maintenance squadrons are established at each base to provide operating and maintenance facilities. It is the general policy to pass major repair and overhaul work back to aircraft depots, augmented by civil contractors.

All the operational forces in Australia are controlled by Home Command, whose A.O.C. is A.V-M. A. L. Walters, C.B., C.B.E., A.F.C., with Headquarters near Sydney. Technical support and equipment supply for the R.A.A.F. is given by units of Maintenance Command under its A.O.C., A. Cdre. E. Hey, O.B.E., with Headquarters near Melbourne. This command includes three stores depots, No. 1 near Melbourne, No. 2 near Sydney and No. 7 near Brisbane, whilst the maintenance and repair of engines and airframes is the function of three aircraft depots, No. 1 near Melbourne, No. 2 near Sydney and No. 3 near Brisbane.

Flying, aircrew and ground-crew training is administered by Training Command under its A.O.C., A.V-M. W. L. Hely, C.B.E., A.F.C., with Headquarters near Melbourne. The command does not deal with training in the Citizen Air Force or with the School of Land/Air Warfare at Williamtown, or with the paratroop train-

(Advertisement)

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Martin-Baker Ejection Seats have been responsible for saving the lives of many airmen throughout the world.

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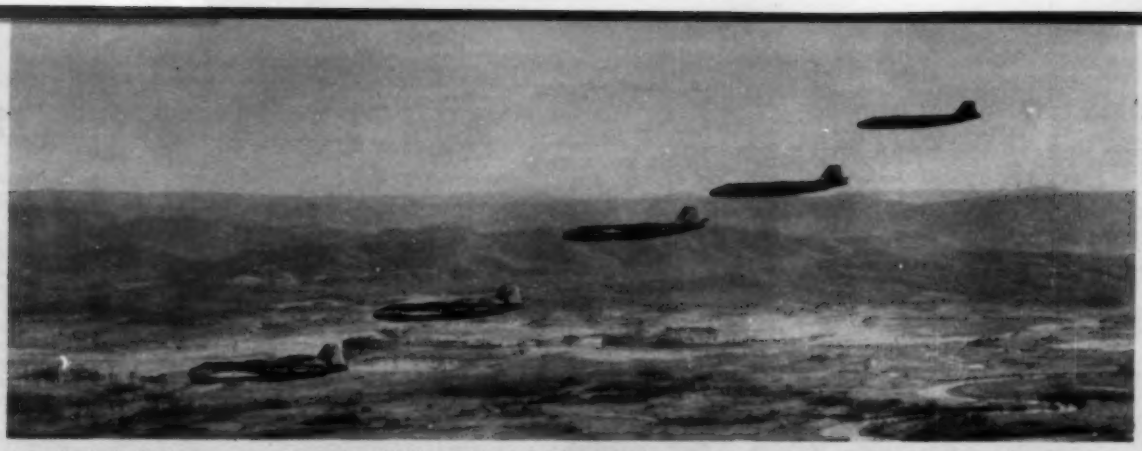
ENGLAND —— CANADA



Australian-built Canberras are now in service with No. 82 (Bomber) Wing, based at Amberley, and give the R.A.A.F. an excellent long-range medium bomber potential. In the not-too-distant future both Avon Sabre and Canberra units will move to Malaya.

A GROWING AIR POWER . . .

ing which is carried out for the purpose of maintaining a supply of trained parachute instructors and paratroopers. Personnel are detached from various units for parachute training and there is no airborne formation as such. Also outside the jurisdiction of Training Command is the Fighter Leader School at Williamtown. Operational conversion is almost entirely carried out in the front-line units, so that a newly trained pilot can be progressively brought up to operational standard by serving as second pilot on the multi-engined types or in a Citizen Air Force squadron, before being posted to a Canberra or Avon-Sabre unit. Pre-wings flying training is carried out at No. 1 Basic Flying Training School at Uranquinty, N.S.W., and No. 1 Advanced Flying Training School at Point Cook. Here also is the R.A.A.F. College, at which pilot, navigator and technical cadets take a four-year course for permanent commissions in the R.A.A.F. At the first of these units pilots are trained to elementary and basic flying standards on Winjeels and Wirraways. Some 130 Wirraways, all of them built during the World War 2 period, are still in service with the R.A.A.F. and of 62 Winjeels ordered, more than 25 are already in service.

After passing through No. 1 B.F.T.S. pilot trainees go to No. 1 A.F.T.S. where they reach wings standard on either Wirraways or Vampire Trainers. About 30 of these were supplied direct from England and a further 68, designated Mk 33 or Mk 35, have been ordered from de Havilland Aircraft Pty. in Australia. Although a training sequence similar to the R.A.F.'s Provost/Vampire scheme would appear to be developing in Australia around the Winjeel and Vampire Trainer, a new pilot-training syllabus has not yet been finalized in the R.A.A.F. Two experimental Wirraway/Vampire courses were recently run with considerable success.

For aircrew other than pilots there are at East Sale the Air Navigation School giving basic and advanced courses and the Air Armament School which still turns out the air gunners needed for the Lincolns and Neptunes. Also at East Sale is the R.A.A.F. Central Flying School which trains instructors. There is a training establishment for ground crews at Wagga Wagga, N.S.W., dealing with all trades except radio, which is the responsibility of an establishment at Ballarat, Victoria.

Each major city has an A.T.C. squadron for boys up to sixteen, while a National Service training scheme takes men for 22 weeks of continuous ground-trade training at one of seven National Service training units based on R.A.A.F. stations. Productive service is not expected of these men but after this period they remain available for mobilization for five years in the reserve. In addition about 200 National Service men are trained each year up to civil pilot's "A" Licence standard by aero clubs working under Government contract. After the 50 hr flying which this requires, these men are encouraged to volunteer for further training in the Citizen Air Force squadrons, but their only obligation is five years' reserve service.

In addition to the airfield construction unit previously mentioned as operating at Butterworth, Malaya, there is a second airfield-construction squadron currently engaged in rebuilding the Darwin airport which is extensively used by civil and Service aircraft. These squadrons were also responsible for the building of the runway in the Cocos Islands which was, incidentally, one of the major staging posts for the Canberras in the 1953 England-to-New Zealand Air Race. Further units of the R.A.A.F. include the Aviation Medicine School which has recently been opened near Melbourne and the Aircraft Research and Development unit at Laverton which includes aviation medicine, technical and aircraft sections. Work carried out here in past years has included development of the Jindivik pilotless aircraft, used extensively in the trials of guided weapons in Australia, a boundary-layer-control glider and rain-making experiments. One of the Avro 707A research deltas is also at present there. From this unit came the nucleus of the flying and technical staff of the Woomera rocket ranges and the R.A.A.F. is, in fact, responsible for the air support of all weapon trials in the Woomera area. A centralized flying unit, including some helicopters, is emerging at the new Edinburgh Field near Adelaide with R.A.F. participation. This unit will be heavily engaged in next month's nuclear-weapon tests in the Maralinga area.

Overall direction of the R.A.A.F. is vested in the Australian Minister for Air, Mr. Athol Townley, who is also responsible for civil aviation in the country. The Chief of the Air Staff is Air Marshal Sir John McCauley, K.B.E., C.B.

Of particular interest at present are the re-equipment plans for the R.A.A.F. The production of the Canberra and particularly the successful extensive re-working of the American Sabre have demonstrated the Australian industry's capacity to produce military aircraft of world-wide significance. Last year an R.A.A.F. team, led by A.V-M. A. M. Murdoch, C.B.E., toured the aircraft plants of Britain and America and rendered a secret report which apparently listed the military aircraft types with which it was suggested the R.A.A.F. should in future be equipped. It seems, therefore, that the policy of buying some aircraft abroad and producing others in Australia may continue. Possibilities might include the Lockheed F-104 as an intercepter, either the Victor or Vulcan as a strategic bomber and the Lockheed C-130 Hercules as a combined strategic and tactical transport. Sir Frederick Shedden, secretary of the Australian Defence Department, has recently criticized the cost and intricacy of British V-bombers. Giving evidence before a Parliamentary public accounts committee, he said that the bombers cost £A1 million (£800,000 sterling) and were "so intricately constructed that servicing had to be done at factories." Sir Frederick also commented that the R.A.A.F. would have to be re-equipped with new aircraft to replace its Sabres and Canberras, built in Australia under licence. There was still no decision by the Government on the types of aircraft to be bought.

Whatever the future may hold, however, the R.A.A.F. is already well set to take a major place in Pacific air power.

NORTHERN ROUTE

(*Continued from page* 295)

We came in across the Great West Road and touched down at London Airport at 8.20 p.m. From Vancouver the whole trip had taken us 22 hr 15 min. From Auckland, passengers had taken four days.

Airport formalities soon completed, the passengers boarded the airline coach, or were met by friends with cars. The young man about to marry, the tall and languid couple, the aviation writer needing a shave. New Zealanders, Canadians, and Englishmen. Already some had clearly slammed their minds shut behind them on their Arctic Circle flight, and were hurrying back into their familiar routine environment. Others, I knew, had not closed the door on their thoughts, and were lagging behind a little. Perhaps as far as Sondrestrom, where we had seen a polar bear—if only the one painted on the control tower. Perhaps even to Vancouver, where it was now five a.m. the following day—but let us not start *that* sort of time-wasting nonsense again.

For us, as well as for the Canadian Pacific crews, the phrase would now be "northern routine," and not northern route. We had completed a flight which was at once uneventful and yet of absorbing interest; relatively short in time and yet somehow spanning a long sector of new and varied experience. In our wallets were the crisp, shiny cards which proclaimed our membership of the Arctic Circle Club (whatever that might imply); while in my mind was the thought that, even if 24 hours in Vancouver was too short a time, one could easily return there from London in an even briefer period.

Experimental CF-100 armed with Velvet Glove missiles.

COMMONWEALTH AVIATION

The Canadian Industry

CANADA'S aircraft industry in 1956, it seems, is being pulled in two directions. On the one hand, there are vast expansion programmes in facilities and staff concerned with design and development; on the other, there are continued and widespread cut-backs on the production side. The background pattern into which the aircraft manufacturing industry fits is of necessity being modified to tackle the serious problems which these two factors in conjunction have brought.

In this background pattern, the hub of policy-making decision lies in Ottawa, the capital—that handsome city, aloof from the factories and noise of Toronto and Montreal, yet with a direct and penetrating concern towards the industry's products, both current and future. Here are located the Department of National Defence and its Defence Research Board, which instigates many of the new Canadian defence projects on which industry activity depends; the Department of Defence Production, which is the procuring agency between the Services and the industry; and the Services Headquarters themselves, whose requirements are the basic foundation for any research, development or production for defence. In addition to the Government departments, and working in close touch with them, are the research establishments, and the associations representing the industry firms and the technical men they employ.

From the Minister of National Defence just two months ago came a report on the country's defence programme for 1956-57. The principal elements in the R.C.A.F. development programme, it said, was the CF-105 project and the guided weapons programme. Giving more detail than had previously been published on this latter work, the report confirmed that a United States air-to-air missile was to be put into production in Canada "in order to make Canadian interceptor aircraft better able to perform their role in the air defence system." It appears probable that this missile mentioned in the report will be the Sparrow 2.

The Canadian Velvet Glove missile project, the report disclosed, was begun in 1950, had resulted in the training of some 400 specialized personnel, and had been accompanied by the development of facilities for research, testing and evaluation of guided missiles. A limited number of Velvet Glove missiles were being produced, particularly for testing and training purposes at the R.C.A.F. establishment at Cold Lake, Alberta. Canadian industry had made progress towards developing design and manufacturing capability in this complex new field. The companies involved in the project, not mentioned in the report, have included Canadair, Avro, de Havilland, Canadian Westinghouse and Computing Devices of Canada; while the original design was by the Canadian Armament Research and Development Establishment at Valcartier, Quebec.

Of the "big three" aircraft firms—Avro, Canadair and de Havilland—only the last-named is working to full capacity and, indeed, has increased its personnel during the year. The other two are continuing production of established types at a much-reduced rate, while preparing for or just beginning the production of new machines.

This stretch-out period has similarly affected the Dominion's only original-design engine company, Orenda Engines, whose new and powerful Iroquois is about to begin flight testing. The possibility of an interim-type of fighter to bridge the gap between the Sabres and CF-100s, and the CF-105, is now quite dead; as far as Canada's defence budget is concerned, the country's fighter eggs are all in the CF-105 basket—a basket which contains also the Iroquois turbojet and the Sparrow missile.

Now nearing service with the Navy and Maritime Air Command of the R.C.A.F. respectively are the Grumman CS2F (widely sub-contracted by de Havilland with companies from Nova Scotia to Manitoba) and the Canadair CL-28, the largest aircraft to be built in Canada. At Downsview, de Havilland's Beavers and Otters, having won the approval of operators in 50 countries, are still steadily coming off the production line, and the plant is also busy with the last machines of the extra Chipmunk order and the first of the CS2Fs.

The work programmes of the many sub-contracting and supply firms are tied naturally to the tempo of the major companies; and here again is seen the apparent anomaly of expansion of development facilities combined with stretch-out of production programmes. Most ancillary companies, however, are widening their interests, increasing the commercial applications of their work,

and have a busy year to report. To assist in resolving more effectively their particular problems which have arisen under the sub-contracting system, a special committee of the Air Industries and Transport Association has been formed.

This association (A.I.T.A.), whose membership includes virtually all of the country's major aircraft constructor, supplier and operating companies, has continued to grow during the past year. The total number of member-companies is now 206, the largest in its 22-year history. The association has fostered an active and varied programme in recent months, which has included an increasing emphasis on technical matters and the formation of new committees.

Under the association's board of directors are separate councils concerned with industrial and transport matters respectively. On the industrial side, there has been a growing activity in the development of markets outside the country for Canadian-made products while, in transport matters, A.I.T.A. has played an active role in co-ordinating the civilian portion of the DEW and Mid-Canada radar-chain airlifts. During the year, agreement was reached with the government's Air Transport Board on proposals for standardizing the terms and conditions of charter operations. This year's president of the association is Mr. E. H. Moncrieff, president of Standard Aero Engine, Winnipeg.

The work of the Canadian carriers in transporting freight in connection with the Mid-Canada and DEWline radar chains has continued at an increased intensity. The DEWline airlift itself has been the subject of controversy during the year. A resolution from the Canadian Air Line Pilots Association which was submitted to the Minister of Transport claimed that the record of Canadian participation in the operation had been "deplorable"; that obsolete aircraft had been used, many of which were in a bad state of mechanical repair; and that the operation had been inefficiently and uneconomically managed. A reply to the charges was made by the Minister of Transport, Mr. G. C. Marler, in which he pointed out that the C.A.L.P.A. comparisons between the DEWline operation and scheduled air-transport operations of American carriers were not valid in view of the vastly different conditions; that, taking into account the great difficulties in organizing an airlift of this size into such difficult territory on short notice, the Canadian carriers were to be congratulated, not condemned; and that all aircraft engaged on the operation conformed with the accepted standards of performance and airworthiness.

It was perhaps not surprising that an operation of the nature of the DEWline airlift caused controversy, particularly as a number of aircraft accidents at the northern strips had been reported. Nevertheless the basic emergency nature of the job, the lack of navigational aids and other facilities in the northern areas, and the potential value of the opening-up of this remote and barren area, must all be taken into account in any balanced appraisal.

A Vigorous Organization

Of all the organizations on the Canadian aviation scene, none has continued to progress with more vigour than the Canadian Aeronautical Institute, the Dominion's equivalent of the Royal Aeronautical Society. During the past year the Duke of Edinburgh consented to become the Patron of the Institute, which is now in its third year; two successful major meetings have been held; and membership had increased by about 50 per cent to a total of 1,500 at the time of the annual general meeting in May this year.

A second joint technical meeting with the Institute of the Aeronautical Sciences was held in Ottawa last November, and the occasion is to be repeated in Toronto later this year. At the annual general meeting in May, 500 members—an extremely healthy proportion of the total membership—attended, the programme comprising a business session, technical sessions and the annual dinner. At the meeting, Mr. R. D. Richmond of Canadair handed over the presidency of the C.A.I. to Mr. Thor E. Stephenson, director of the aircraft branch of the Department of Defence Production; and the McCurdy Award for 1955 was made to Mr. J. H. Parkin, director of the National Aeronautical Establishment and of the Division of Mechanical Engineering of the National Research Council, for his contribution to aeronautical research in Canada and his untiring leadership in this field.

Other important C.A.I. occasions during the year have been the inauguration of new branches at Edmonton and Cold Lake (other branches are at Montreal, Ottawa, Toronto, Vancouver and Winnipeg) and a building-up of interest in the formation of further branches at Calgary and Quebec City. The headquarters of the Institute has now been moved to the Commonwealth Building, Ottawa, where the staff is headed by the secretary-treasurer, Mr. H. C. Luttman.

These are some of the ingredients of the aviation scene in Canada today. Returning to the manufacturing industry (the companies with whose activities and products many of the following pages are concerned) the obvious question—whether the industry is too large for peacetime needs—must be asked. For there are many factories which could easily be producing at many times the present rate. There is no doubt at all concerning the imagination and confidence with which plans for future expansion of design manpower and test and development facilities are being carried forward. But the present production picture cannot be ignored.

Those concerned at Ottawa, too, are not unaware of this problem. The Department of Defence Production, recognizing that the industry could handle more work than present requirements demand, is concentrating on forward planning in an endeavour to find a realistic answer. For some time it has been D.D.P. policy to have early and close contact with the Defence Department and so judge and help to control the impact which defence projects would have on the level of manpower in the aircraft industry.

The answer to the question of industry size lies in the definition of peacetime needs—and more basically the definition of peacetime itself. During the last war Canada learned—the hard way—about the perils of dependence on sources of production and supply outside the country; and this lesson now has to be related to the changed tempo of readiness implied in current nuclear weapons and strategies. To deliberately reduce the production capacity which has been deliberately built up clearly would be dangerous, while at the same time an unthinking reliance by the companies on defence contracts only could lead to excessive peaks and troughs in activity and employment, and is obviously not in the best long-term interest of the industry. Different considerations give different answers but, if only from the amount of money which is being invested and ploughed back into the Canadian aviation industry, it appears certain that there is no lack of confidence in that industry's future and that, far from a reduction in overall size, the increase (the largest increase in any Canadian manufacturing industry in terms of employment based on the 1949 index) which has characterized the Canadian aircraft industry in the post-war period will continue in future years.

The Future

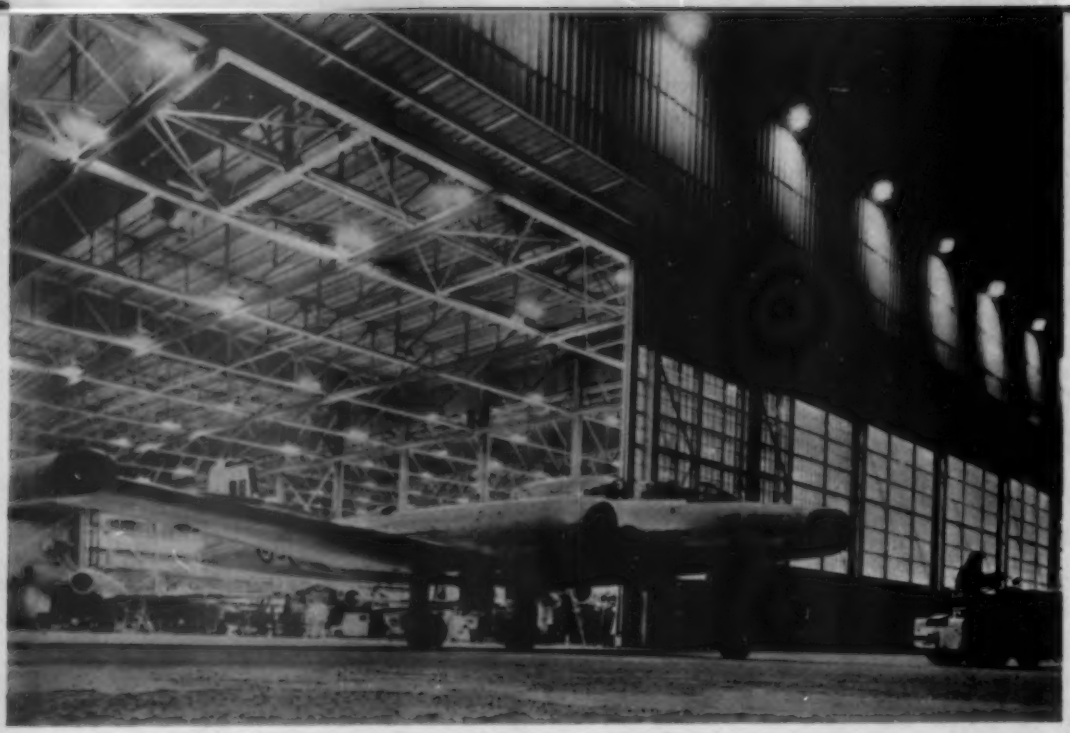
This challenging, changing concept that is the future of Canadian aviation has been the subject of much discussion during recent months, when briefs have been presented by various companies before the Royal Commission on Canada's Economic Prospects. Among the forecasts presented for the next 25 years are that general growth will continue to follow the pattern of initial development to military applications followed by civil applications; that significant increases will take place in the fields of air transport and the applications of aerial geophysical surveys to the search for new mineral sources; and that there is a need for a long-range development programme to keep engineers and scientists in the country.

While it remains an inescapable fact that the future development of the Canadian industry will depend largely on military requirements, a reminder that the industry could usefully give more thought to supplying and servicing the country's civil air transport industry was given by Mr. R. N. Redmayne of A.I.T.A. in an address before the Canadian Aeronautical Institute in May. Certainly there is little doubt that, on the operating side, the future scope for Canadian aviation is unlimited.

On the manufacturing side, the Canadian industry—with its production capacity firmly established, if not fully utilized at present—is now seen to be consolidating in the fields of research, testing and development and giving careful thought to future problems. This is the present picture, the base from which future developments will spring.

In the previous two Commonwealth issues of *Flight* the background and work of the Canadian aircraft companies was described in detail. Our intention in this third such special issue is to illustrate and report on progress over the past 12 months. First-hand accounts of the activities of some thirty of the main and ancillary firms are included, based on visits to these companies by the Editor and by Kenneth Owen, *Flight* staff writer, during this summer.

Mr. T. E. Stephenson, C.A.I. president (left) and Mr. J. H. Parkin, winner of the 1955 McCurdy Award.



Avro Aircraft, Malton: CF-100 Mk 5 being towed from production flight-test hangar for night engine run.

The Canadian Industry...

A. V. ROE CANADA, LTD.

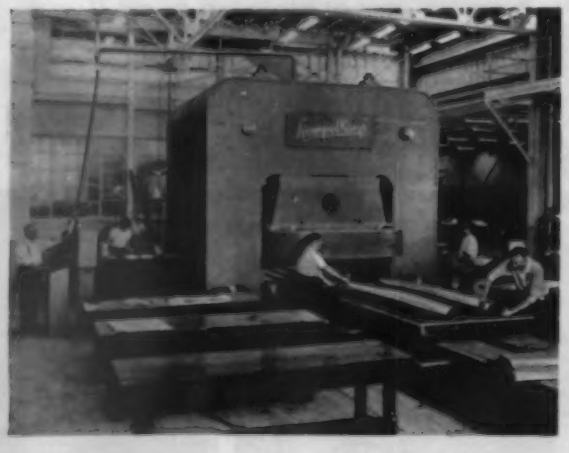
SINCE September last, A. V. Roe Canada has been the parent company of four wholly owned operating subsidiaries. The fourth, acquired at that time, is Canadian Car and Foundry; the others are Avro Aircraft, Orenda Engines and Canadian Steel Improvement. These four companies, having nine manufacturing and engineering establishments covering a total floor space of 5½ million square feet, employ 22,000 people (approximately 15,000 of whom are engaged on aircraft work).

December of last year marked the tenth anniversary of the formation of the A. V. Roe Canada company. More recently, Mr. C. D. Howe, Canadian Minister of Defence Production, stated that the Avro Aircraft and Orenda Engines companies had purchased some £6,300,000 worth of Crown-owned machinery and equipment in their factories, of which Orenda's share was £4,200,000. Avro Aircraft, he said, now owned its entire plant including all machine tools and equipment.

The current work of the four operating companies, and their progress over the last twelve months, is described under separate headings below. Chairman of A. V. Roe Canada, Ltd., is Sir Roy Dobson; Crawford Gordon, Jr., is president and general manager.

Avro Aircraft, Ltd. Although the main engineering effort at Avro is now directed towards the CF-105 supersonic delta, production of the CF-100 is continuing, but at a much-reduced rate. During the last 12 months, approximately 184,000 sq ft of floorspace has been added as part of the company's $5m expansion programme,

Recently installed at Avro Aircraft: 15,000 ton hydraulic rubber press.



which has also included the installation of a 15,000-ton hydraulic rubber press and a large skin mill.

This expansion of facilities is being made entirely in connection with the CF-105 programme, which is progressing on schedule. A wooden mock-up and a metal mock-up of the delta have been constructed, and the main assemblies are well under way in the plant. Production tooling is continuing for the 105, which initially is to be powered by Pratt and Whitney J-75s and later by Orenda Engines Iroquois. An initial production batch has been ordered by the Canadian government, and the first machine is expected to be completed by late spring or early summer of next year.

The current production model of the CF-100 is the Mk 5 high-altitude version which features extended wingtips, modified tailplane and deletion of fuselage rockets, and which is eventually to be powered by the "wee-heat" version of the Orenda. This is the ninth type of CF-100 to be built since the first prototype flew in January 1950, the others being the Mks 1, 2, 2T (dual), 3CT (dual), 3, 3D (dual), 4A and 4B. The order for 510 Mk 4 CF-100s was completed earlier this year, when the production rate was down to 10 per month, and production of the Mk 5 is believed to have been stretched out since to give an even more limited current rate. Development of a Mark 6 version is under way.

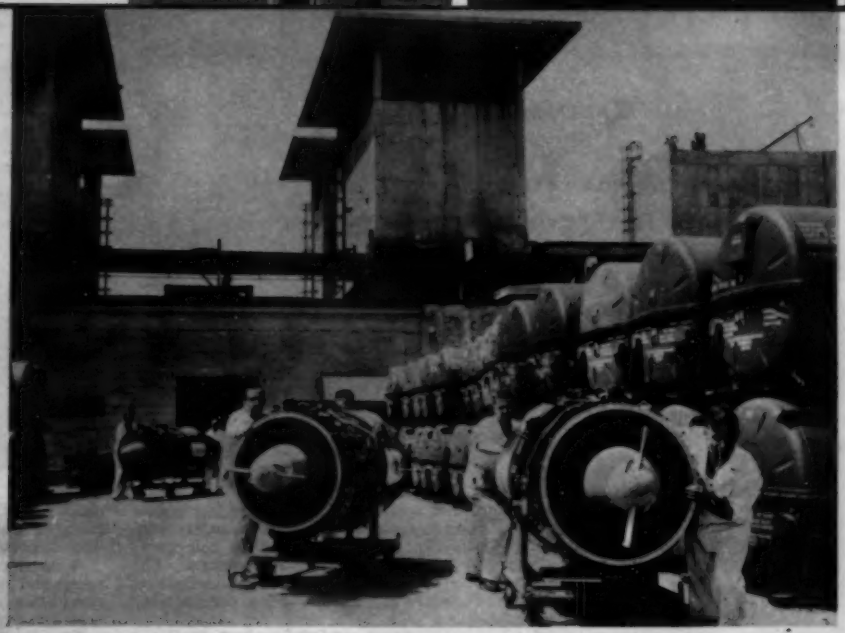
An announcement was made during the past year concerning the company's Project Y "saucer" (or horseshoe) design, originally conceived in 1951. This announcement, made by the U.S.A.F., was brief, stating only that the Service had a research and development contract with Avro Aircraft "to explore a new aircraft design concept."

Fred T. Smye, who was the first employee of the A. V. Roe Canada company on its formation in 1945, has recently been appointed president and general manager of Avro Aircraft (he was previously vice-president and general manager). Approximately 8,000 people are at present employed by the company.

Orenda Engines, Ltd. Progress with the development of the new and powerful PS-13 Iroquois; a slowing down of production of the Orenda; and the announcement of a $7.7m expansion of engine test facilities are three major features of Orenda Engines' past year. Their combined effect is reflected in the higher number of engineering development and test personnel, and a decrease in production and total personnel figures.

The PS-13 Iroquois, designed primarily for Avro Aircraft's CF-105, is the subject of a D.D.P. development contract. Its maximum rating has been unofficially quoted as 20,000 lb or 30,000 lb with afterburner. Six engines of this type have been built, a number of the early ones being used for specification testing of components. The test for the engine's 50 hr preliminary flight rating has been successfully completed, and flight testing of one specimen will shortly begin. The engine will be mounted on the starboard side of the rear fuselage of a B-47, on loan from the U.S.A.F. (artist's impression on opposite page).

Detailed production plans for the PS-13 cannot yet be made, but it seems clear that (excepting possible export orders) the numbers involved will be much smaller than the Orenda run, and



Artist's impression of Iroquois B-47 test-bed installation; Orenda 11s being wheeled from test-cell area.

it is probable that there will not be extensive subcontracting. U.S.A.F. interest in the Iroquois has been reported but, if this hardened into a concrete order, U.S. production under licence would be adopted.

The peak production rate of Orenda engines had already been cut back from 100 engines per month to 50, and then to 40 per month, when the 3,000th Orenda was completed in May of this year. Since then the rate has slowed down further to 25 per month, at which level production is expected to continue for some time. Current models are the Mk 11 and the Mk 14, as fitted to the CF-100 and the Canadair Sabre 6 respectively. It is reported that the Mk 5 version of the CF-100 is to have Orenda's version of Bristol's "wee-heat" but with Marquardt influences, particularly in connection with the variable finger-type nozzle. The reduction in personnel numbers caused by the slowing down of Orenda production has brought the total number of employees down to about 5,000.

The new expansion of test facilities affects both Malton and Nobel. The programme includes the provision of six new test cells, a high-altitude test facility, an aerodynamic test facility and a combustion test facility at Malton; and test cells for developing afterburner design features and for investigating internally cooled turbine-blade design under realistic conditions, at Nobel. Most of the construction work is expected to be completed this year. Already in use at Malton is the new 60,000 sq ft sales and service extension to the main plant.

Although no announcement has been made by the company, Orenda interest has been reported in a light turbojet (possibly the Viper) which could be produced to power the projected Canadair CL-41 jet trainer, if a contract were awarded for this machine.

Floorspace areas occupied by Orenda are: Malton, 825,000 sq ft manufacturing and 295,000 sq ft engineering and experimental (plus 160,000 sq ft new test facilities); Nobel, 65,000 sq ft full-scale testing (plus 20,000 sq ft new test facilities). A recent promotion was that of Walter R. McLachlan from vice-president and general manager to president (and general manager).

Canadian Steel Improvement, Ltd. Indicative of the progress made in the provision of new facilities at the Etobicoke plant of C.S.I. since our 1955 visit is the fact that the total equipped floorspace was seen this year to have more than doubled. The plant area is now approaching 200,000 sq ft and, with an increased number of technical staff (particularly on the foundry side), the total of employees is now approximately 350. It has been a very active year for all three main sections, Engineering, Production and Sales.

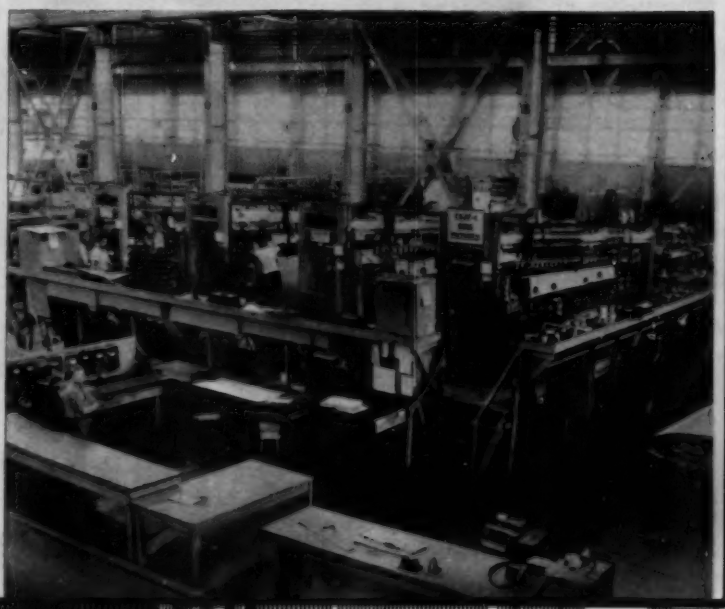
In the company's new forge bay, which is now complete, a ten-ton gravity drop hammer has been installed. Further forging equipment which is being added includes a 2,000-ton hydraulic forging press and a number of open-frame hammers from three to 40 cwt. The total forge area devoted to the production of steel, aluminium, titanium and high-temperature precision forgings for aircraft requirements is approximately 45,000 sq ft.

Also completed and now in operation is the light-alloy foundry. The total foundry space for the manufacture of all types of sand, permanent mould and pressure die castings in aluminium and magnesium is about 77,000 sq ft.

The company is perhaps most proud of its process for pro-

The Canadian Steel Improvement plant at Etobicoke, near Toronto.

Production of CS2F-1 wings is carried out by Canadian Car and Foundry (see page 302). Below are shown outer-panel fixtures at the company's Fort William plant.



The Canadian Industry...

Bristol Aircraft (Western): Conversion of CF-100 Mk 3s to trainer version.

ducing precision forgings in titanium, and the C.S.I. forge is now accepting a healthy amount of such work, including orders from major U.S. aircraft companies. At present all the company's titanium work is for aircraft and aero-engine applications. The volume of business connected with commercial applications of forgings and castings in other metals has been considerably increased over the past year.

Vice-president and general manager of C.S.I. is J. A. Wellings.

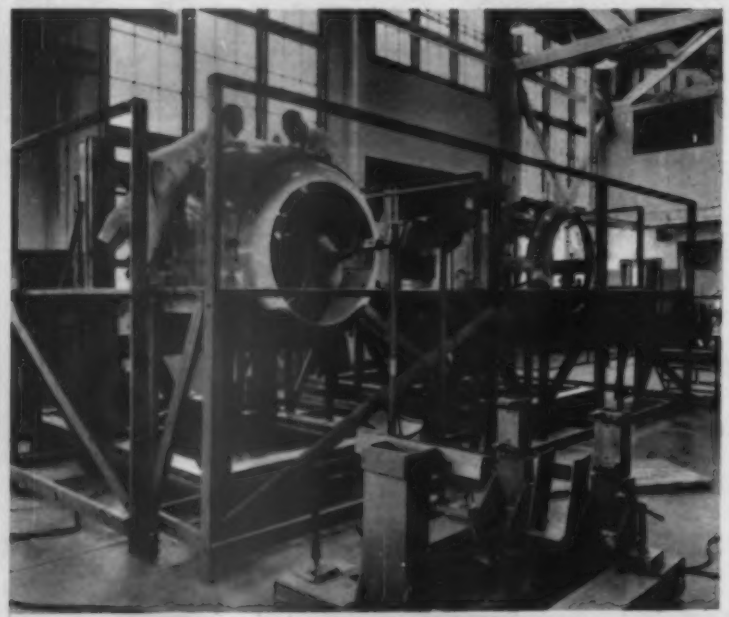
Canadian Car and Foundry Company, Ltd. The acquisition of Canadian Car and Foundry one year ago by A. V. Roe Canada has not resulted in any major change in aircraft work at CanCar's plant near Lakehead Airport, Fort William. Production of the complex wing of the CS2F-1 has progressed well over the past twelve months, and deliveries have been made ahead of schedule.

A contract has been received for the manufacture of further wings and tail surfaces for the D.H.C. Otter, following the recent completion of the first 100 sets. Other new work includes an amount of tooling for the CF-105.

The production of Harvard spares continues, and the volume of supply of these components has increased markedly over last year's total. It may be recalled that the world sales rights, excluding U.S.A., for Harvards and spares are held by CanCar.

Of 25 T-34A Mentors which CanCar manufactured for the R.C.A.F. (out of a total order of 125), 24 have now been overhauled, test flown and dismantled and are being shipped to Turkey on behalf of the Canadian government.

Executive head at Fort William is R. E. Henderson, who is now vice-president, manufacturing (automotive and aircraft divisions).



Production of CS2F engine nacelles (above) is carried out at the Winnipeg plant, shown below, of Bristol Aircraft (Western).

THE BRISTOL AEROPLANE COMPANY OF CANADA (1956), LTD., AND ASSOCIATED COMPANIES

A RE-ORGANIZATION of the Bristol group of companies in Canada took effect on January 1, 1956, with the aim of consolidating the group under a single Canadian parent company. ***The Bristol Aeroplane Company of Canada (1956), Ltd.,*** is now the parent company of three operating subsidiaries in Montreal, Winnipeg and Vancouver, and the Winnipeg facility, previously MacDonald Bros. Aircraft, Ltd., is now known as Bristol Aircraft (Western), Ltd. Sir Reginald Verdon Smith and R. J. Reynolds are respectively chairman and president of each of the four Bristol companies in Canada, and Mr. Reynolds is also president of a recently established fourth subsidiary of the parent company, Bristol de Mexico, S.A. de C.V. This new company (formed in April of this year) will operate an engine overhaul base at the Central Airport at Mexico City. The secretary of B.A.C.C. (1956), B. A. Chalmers, has been appointed a director and vice-president of all four subsidiaries.

Bristol Aero Engines, Ltd., in its North Montreal plant, continues to service and overhaul engines and powerplants for civilian and Service operators. The overhaul of Centaurus engines there has now ceased; current work includes that on Hercules, Merlins, Wright R-3350 Turbo-Compound and R-1820 engines and on Lancaster and North Star powerplants. Vice-president and general manager is A.V.-M. A. L. James, C.B.E.

Bristol Aero Engines (Western), Ltd., has commenced a major expansion project at its Vancouver Airport location in connection with forthcoming work on the Proteus turboprops of the five Britannia aircraft ordered by Canadian Pacific Air Lines. The complete overhaul and repair of the Proteus powerplants will be undertaken by Bristol, whose plant working-area is to be increased by almost 50 per cent to approximately 60,000 sq ft.

The new facilities will include administration and engineering offices; new overhaul areas; and a test house stated to be the largest turboprop test cell of its kind in Canada. Work on the whole project which, it is estimated, will cost $500,000, should be complete by next spring.

The present work of repairing and overhauling aero engines, powerplants, airscrews and carburettors for the R.C.A.F., R.C.N. and commercial operators will be continued by the west-coast Bristol company, whose executive head is J. H. Holt (vice-president and general manager).

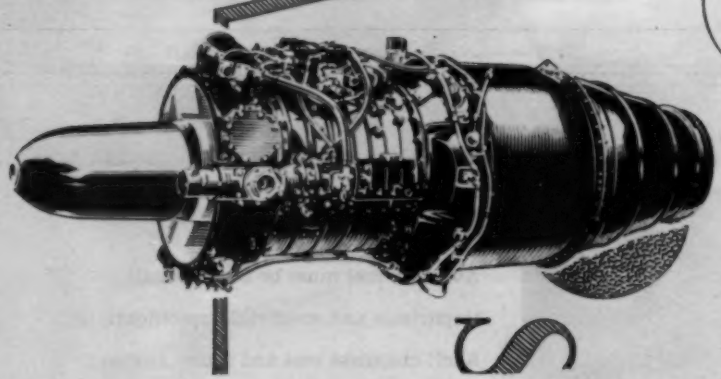
Bristol Aircraft (Western), Ltd., at Stevenson Field, Winnipeg, has been developed into the Bristol group's largest and most important manufacturing facility in Canada. During the last year preparations have been made for a helicopter design team to begin work at Winnipeg and, as mentioned, the name of the company has been changed from MacDonald Bros. Aircraft to Bristol Aircraft (Western).

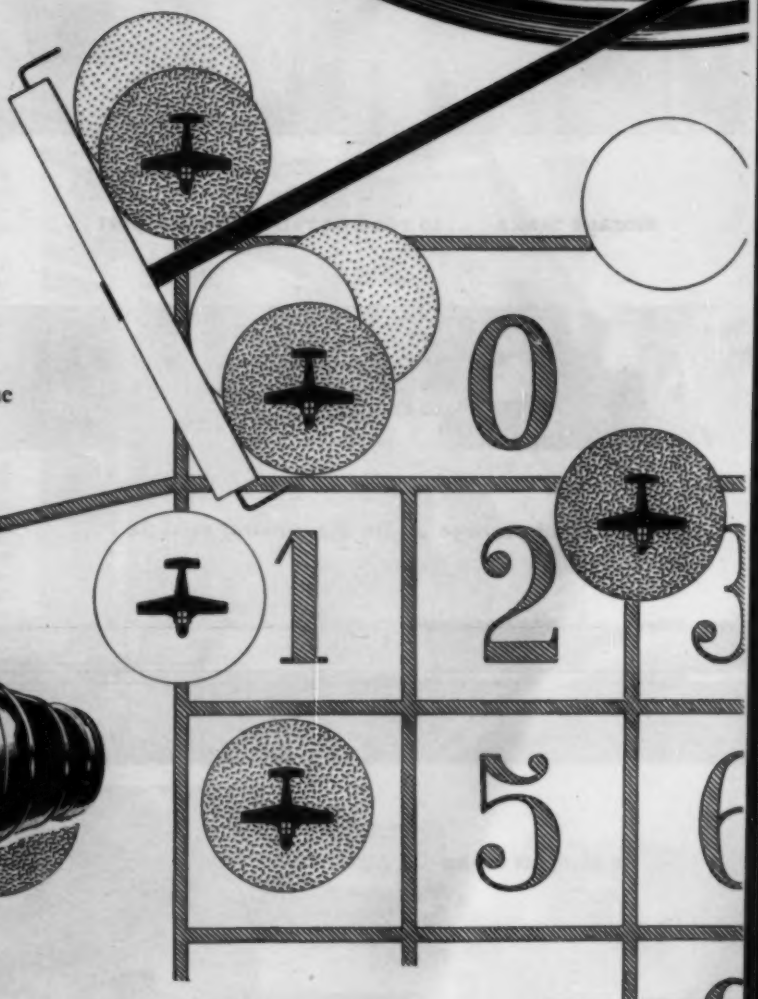
FLIGHT, 24 *August* 1956

Progress is no gamble...

In the design of aircraft engines, any form of speculative development—we think of it simply as gambling—may be not merely irresponsible, but positively destructive. Apparent but in the long run illusory success can cause irreparable loss of time, resources and initiative. That is why we cleave resolutely to the policy of systematic development which has produced such engines as the Viper turbojet, power plant of Britain's first basic jet trainer.

That is why we are ceaselessly exploring and extending the potentialities of these proven types, in constant, reliable readiness for the requirements of aircraft evolution.

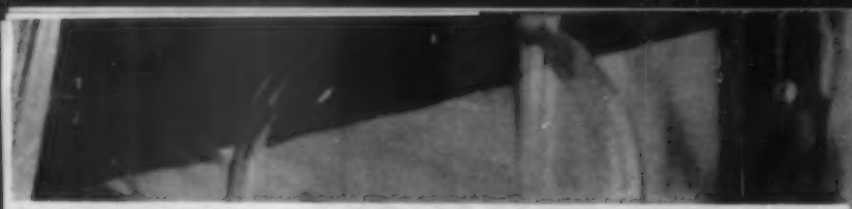




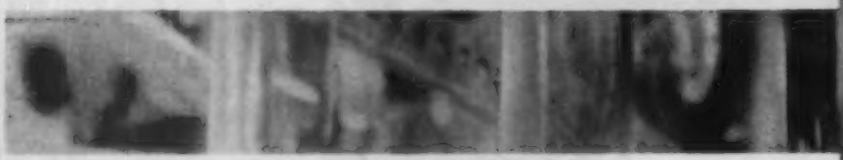
ARMSTRONG SIDDELEY AERO ENGINES

ARMSTRONG SIDDELEY, COVENTRY & BROCKWORTH

Members of the Hawker Siddeley Group



Right down the line . . . . .



from refinery to ocean tanker . . . to bulk

storage tanks . . . to road or rail tank transport . .

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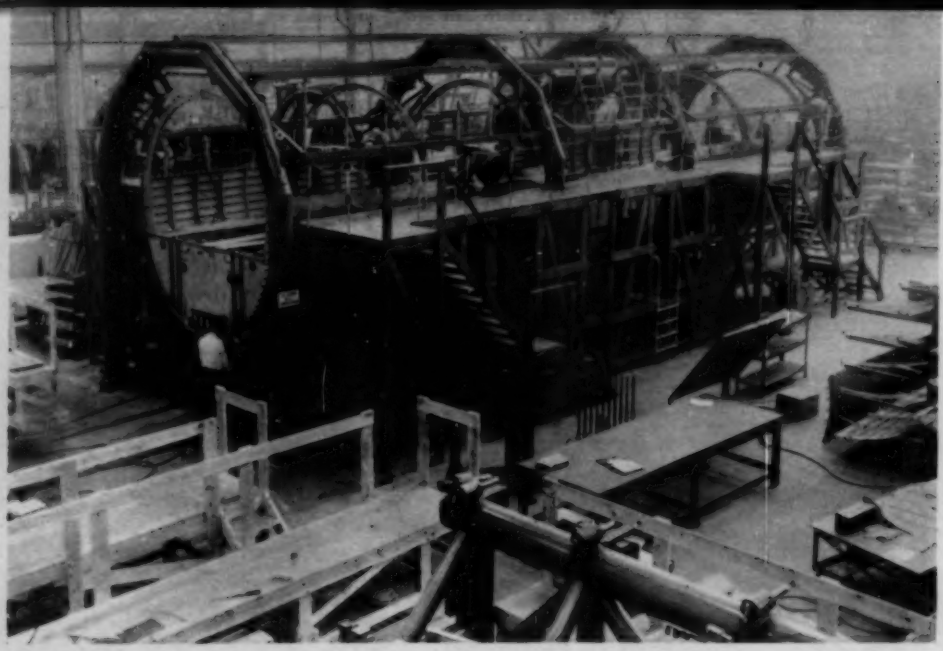
to aircraft tanks . . . . . .

Aviation fuel must be free from all impurities and meet rigid specifications. Shell chemists test and retest at every stage from refinery to aircraft to make sure. Another part of the

SHELL WORLD-WIDE AVIATION SERVICE

SHELL

The Canadian Industry...



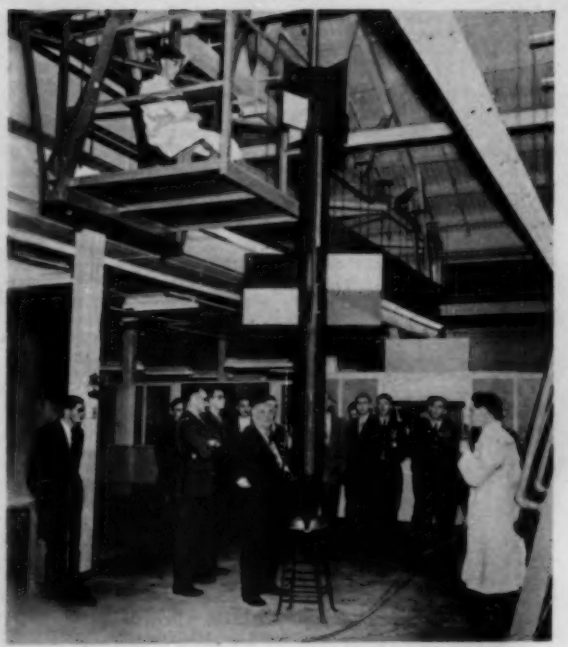
At Canadair's Cartierville plant: (clockwise from top) CL-28 centre-fuselage jig; moment - of - inertia test on Velvet Glove missile; Turbo-Compound powerplant testing for CL-28; CS2F rear fuselages, 42 having been made.

The contracts for the modification of 50 CF-100 Mk 3s to trainer versions, and for the light-bomber conversion of B-25 Mitchells, have now been completed. New overhaul and repair projects recently begun include a CAIR (calendar aircraft inspection and repair) programme on Beech Expeditors, and a repair and overhaul contract from the D.D.P. for CF-100 aircraft in the western half of Canada.

On the manufacturing side, production is under way of engine nacelles and other components for de Havilland's CS2F-1; and the company is continuing to build tail-cone assemblies and jet-pipes for the Orenda engine and (under licence) Edo floats for the de Havilland Canada and Cessna companies.

A helicopter design team of Bristol Aircraft (Western) which has been selected and recruited during the past twelve months has been gaining experience with the helicopter division of the English parent company at Filton, and is due to travel to Winnipeg soon. The design and manufacture of helicopters at Winnipeg—provided the Canadian demand exists—is envisaged as a future development.

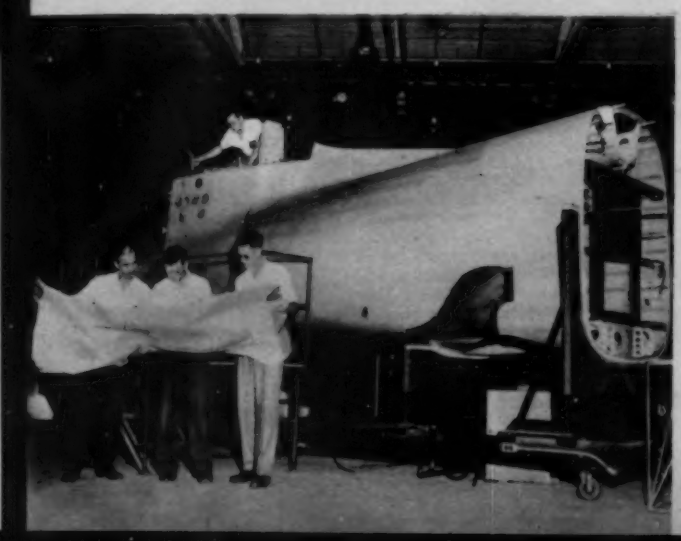
Vice-president and general manager of Bristol Aircraft (Western) is W. S. Haggett.

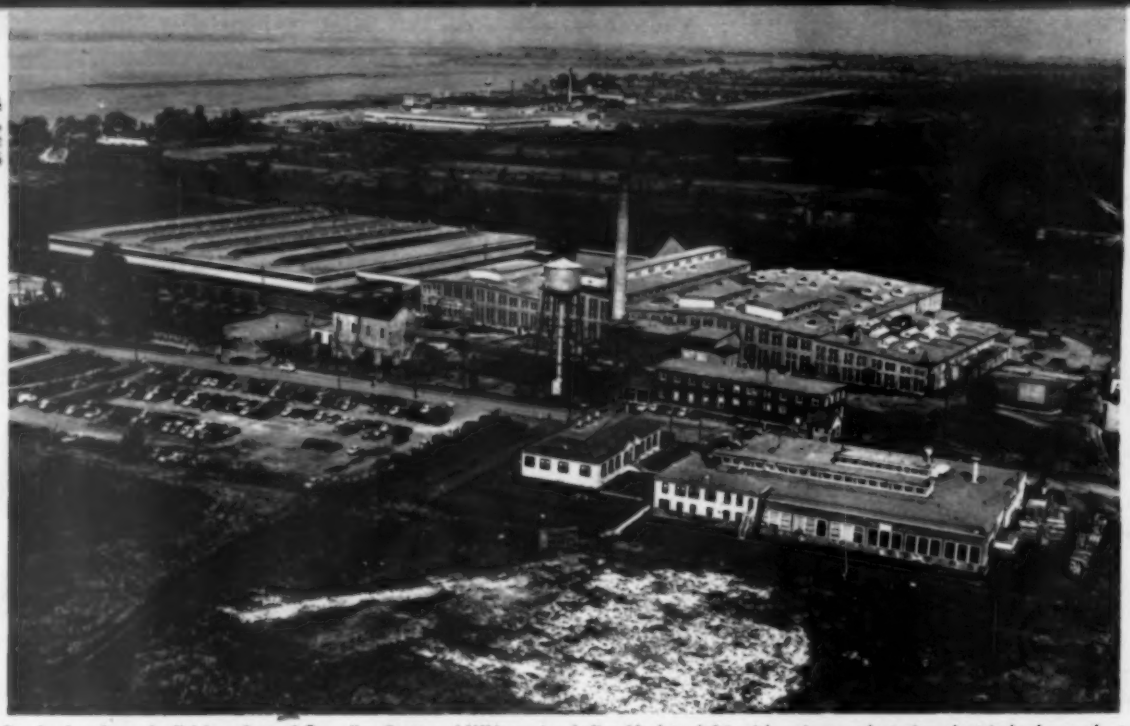


CANADAIR, LTD.

A SUBSIDIARY company of the General Dynamics Corporation of the U.S.A., Canadair has made steady progress during the last twelve months on its major new commitment, the CL-28 maritime-reconnaissance version of the Bristol Britannia. In the production shops the main assemblies of the first CL-28 aircraft are now well advanced; mating of the main units is due this month; the machine should come off the line in December; and the first flight is planned for the early spring of next year, following vibration tests on the equipped aircraft and a detailed weight scrutiny.

In parallel with the construction of the CL-28, the test rigs for the various components and systems of the aircraft have been designed, made and brought into use. The Wright Turbo-Compound powerplant will have logged 250 hours of test and endur-





Overhaul and supply division plant of Canadian Pratt and Whitney (excluding block on left), with main manufacturing plant in background, at Jacques Cartier, Montreal. With forthcoming expansion of main plant, a helicopter unit is to be established near Overhaul and Supply.

ance running by October, when the second CL-28 fuselage will commence static testing.

The order for CL-28 aircraft now stands at 25, with an expected increase in stages to 50 machines. A military transport version of the CL-28 known as the CL-44 has been projected; an R.C.A.F. decision concerning this aircraft is believed to be very near.

Production of F-86 Sabres and T-33 Silver Stars continues in Canadair's Plant 2, although at much-reduced rates compared with the peaks of Korean-time activity. Over 1,500 Canadair Sabres have now been built, the current version being the Mk 6 powered by the Orenda 14 engine. Our visit to Canadair this year coincided with the day of departure of six Sabres for the Colombian Air Force; other recent orders include 34 for the South African Air Force.

The production of T-33 Silver Stars has been "stretched out" still further, the present rate being about three per month, with some 550 machines completed to date. The total number has been increased and the remaining 100 T-33s should keep the line going until 1959.

New developments at Cartierville during the year included the formation of a General Atomic Division of the company to design, construct and test a nuclear-research test reactor for Atomic Energy of Canada, Ltd.; and the receipt of a "sizeable" order from the Republic Aircraft Corporation for the fabrication of tooling for the F-105—an order which, the president of Canadair said, might lead to similar contracts for original tool design.

Other work during the last twelve months has included the production, under subcontract from de Havilland, of CS2F rear fuselages (20 of which had been completed at the time of our visit in June) and radomes. A total of 42 rear fuselages are being built by Canadair, after which this item of the CS2F will be transferred to Enamel and Heating, of Amherst, Nova Scotia, who are already making the tail unit. At that time, in turn, manufacture of the CS2F front fuselage may be moved from de Havilland at Downsview to Canadair. Also in hand at Canadair, to assist in filling-in the production gap before the CL-28 line gets under way, is the manufacture of the first wing-skins for the Avro Aircraft CF-105 (until new tools become operational at the Avro plant), and other sub-contract work for Canadian and American companies.

In the field of guided weapons, Canadair were responsible for the limited manufacture of the airframe for the Velvet Glove air-to-air missile, and the assembly and testing of the missile as a whole. Following this project, it is expected that the company will have an important part to play in the production of the missile (believed to be the Sparrow 2) eventually chosen for the CF-105.

One of a number of design projects which the company has completed is for an R.C.A.F. jet trainer, known as the CL-41 and powered by a light turbojet such as a Rolls-Royce project or Armstrong Siddeley Viper. No official government decision concerning the CL-41 has been made.

The company now employs almost 9,000 people, and occupies some 2,600,000 sq ft of floor space. During last year, much new capital investment went into the new manufacturing engineering and engineering research buildings at Plant 1; while, for the immediate future, a small extension to the pre-flight hangar in order to accommodate the CL-28 has been planned.

Under John Jay Hopkins, chairman and managing director, the executive head of Canadair is J. G. Notman, president and general manager.

CANADIAN PRATT AND WHITNEY AIRCRAFT COMPANY, LTD.

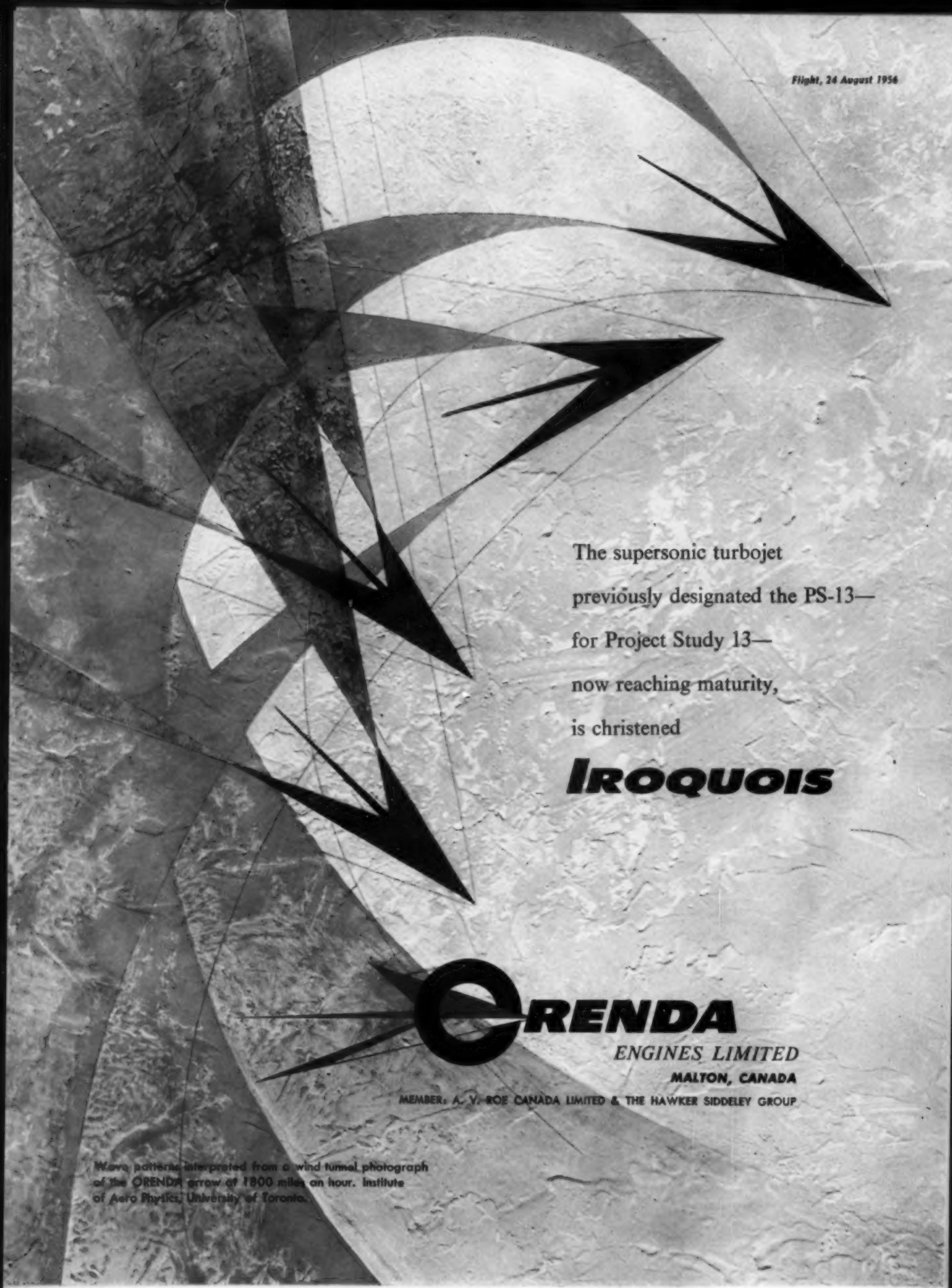
FOLLOWING the purchase by the company last September of the plant machinery and equipment formerly owned by the Crown, a major expansion programme was announced by Canadian P. and W. in May of this year. Costing approximately five million dollars, this new project will involve a 90,000 sq ft addition to the main manufacturing plant at Jacques Cartier, the purchase of additional machinery and equipment, the enlargement of the company's helicopter facilities, and the establishment of a new design and development group.

The increasing tempo of activity which is implied in these plans was also obvious from our recent tour of the plant and our talks with Mr. Ronald T. Riley, president of the company. The tooling programme for the Wright R-1820 Cyclones for the CS2F-1 aircraft has now been completed, and the production run has started. In addition, the range of spare parts manufactured at Jacques Cartier for various Pratt and Whitney engines has been widened, necessitating more equipment and extra factory space.

The helicopter overhaul shop has been increasingly busy over the past year, and there is now no longer room to accommodate helicopter components in the engine and propeller shops. A separate helicopter unit is therefore to be established near the overhaul and supply division plant, and the company's licensed heliport—Canada's first—is to be moved from the main plant to this location.

The new design and development group will be concerned with aircraft powerplants, helicopters, and aircraft accessories. While the company obviously will continue to sell, service and manufacture under licence the products of its associated companies (the Pratt and Whitney Aircraft, Hamilton Standard, and Sikorsky Aircraft divisions of United Aircraft Corporation) this new group will enable it to adapt these designs to meet Canadian conditions and, eventually, to carry out original design and development.

Approximately 2,000 people are now employed by Canadian Pratt and Whitney, a figure that is expected to increase to 2,800 (together with a total floorspace expansion to over 530,000 sq ft) with the implementation of the present expansion programme. In addition to the increase in manufacturing area, a second-storey section will be built on to the main plant to provide increased office accommodation.



The supersonic turbojet
previously designated the PS-13—
for Project Study 13—
now reaching maturity,
is christened

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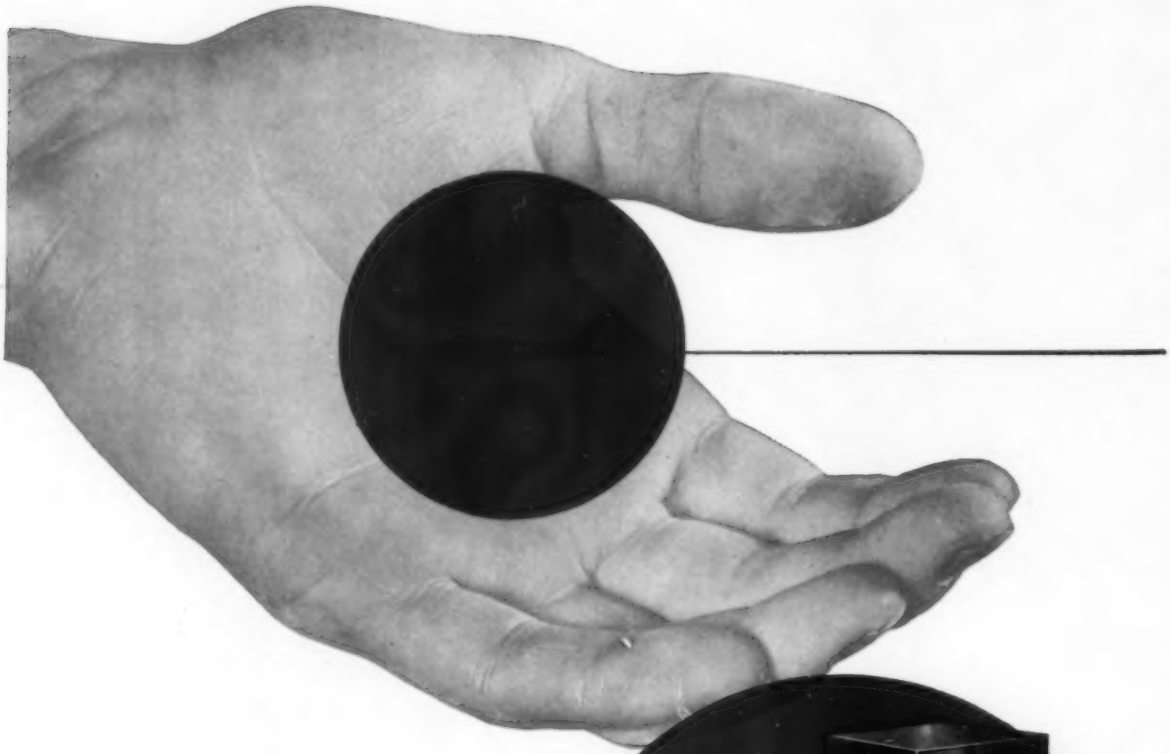
ORENDA

ENGINES LIMITED

MALTON, CANADA

MEMBER, A. V. ROE CANADA LIMITED & THE HAWKER SIDDELEY GROUP

Mach patterns interpreted from a wind tunnel photograph of the ORENDA arrow at 1800 miles an hour. Institute of Aero Physics, University of Toronto.



The STRAIGHT WAY Home

The R Theta D-R Navigation Computer System, produced for the RCAF, is the first of its type in the world. Completely electro-mechanical in operation, no ground or airborne transmitted information is needed. Now under evaluation by the armed services of the U.S.A. and U.K., the R Theta will guide the pilot the straight way home no matter where he flies.

The R Theta D-R Navigation Computer

This new milestone in aviation was invented by Wing Commander J. G. Wright, RCAF. He was awarded the McKee Trans-Canada Trophy for 1954 for this contribution to Canadian aviation. The R Theta was developed and is being produced for the RCAF by PSC Applied Research Ltd.

PSC APPLIED RESEARCH LTD.

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Plant at Vancouver International Airport. Engine overhaul and repair for western establishments of R.C.A.F. and the airlines.

BRISTOL AIRCRAFT (WESTERN) LIMITED

Winnipeg company, largest aircraft plant in western Canada, modifies aircraft for R.C.A.F.; makes aircraft and engine components; produces Edo aircraft floats under licence.

BRISTOL AERO ENGINES LIMITED

Extensive repair and overhaul plant in Montreal North, with test cells as modern as any in North America. Handles piston-type engines, mainly for R.C.A.F. and T.C.A.

THE BRISTOL AEROPLANE COMPANY OF CANADA (1956) LIMITED

MONTREAL • WINNIPEG • VANCOUVER • MEXICO CITY

Head Office and holding company for associated Canadian companies in the International Aviation Building, Montreal.

THE DE HAVILLAND UC-1 OTTER

In Service with the United States Navy in the Antarctic

The UC-1 Otter is adaptable for
use with wheels, floats, or skis.

Designed and built by

THE DE HAVILLAND AIRCRAFT OF CANADA, LIMITED

Postal Station "L", Toronto, Ontario

2-56

The final assembly line of Grumman CS2F-1 Aircraft at the de Havilland plant at Downsview.

The Canadian Industry . . .

THE DE HAVILLAND AIRCRAFT OF CANADA, LTD.

FOLLOWING a four-month stoppage of production caused by a labour dispute, which ended last November, de Havilland at Downsview, Toronto, are busy again on an extremely full manufacturing, assembly and overhaul programme. The first two Canadian-built Grumman CS2F-1 aircraft are about to be delivered to the Royal Canadian Navy; Beaver production has reached the 1,000 mark; and a new twin-engined, general-purpose aircraft is at the mock-up stage.

The present CS2F-1 contract calls for 66 machines, with spares provisioning for 100. The company is well pleased with the efforts of the subcontractors—and there are many—on this machine, and it is due only to last year's labour dispute that the first deliveries to the Navy were postponed from May of this year to September. The planned delivery rate thereafter is two per month. A notable date in the CS2F programme was May 31, 1956, when the first Canadian-built machine made its first flight.

The company's expanded programme of work has overloaded the space available in the 623,000 sq ft factory erected two years ago on the south side of Downsview Airport, and the CS2F assembly line (together with other departments) has now been moved to the original north plant. The only major change in the allocation of work on the programme (following a Government policy decision) is that, after the first 42 aircraft, construction of the rear fuselage is to be transferred from Canadair to Enamel and Heating, who are already making the tail unit. At that time construction of the front fuselage may be passed from de Havilland to Canadair. Other subcontracting remains as reported under the respective company headings, the final assembly and installation of equipment being carried out by de Havilland.

Production, overhaul and sales of Beavers and Otters have increased steadily in volume since the beginning of this year, and a substantial further increase in production of the civil versions of both these machines is planned for next month. Some 60 per cent of the production of these versions is now destined for export. Indicative of the high rates of production recently achieved are the June figures of 26 Beavers and 12 Otters.

Well over 600 L-20 Beavers for the U.S. Services have now been produced, bringing the total of civil and military versions past the 1,000 mark. Over 60 Otters, also, have gone to the U.S.N. and U.S. Army, and over 100 to the R.C.A.F. and other Services and to commercial operators.

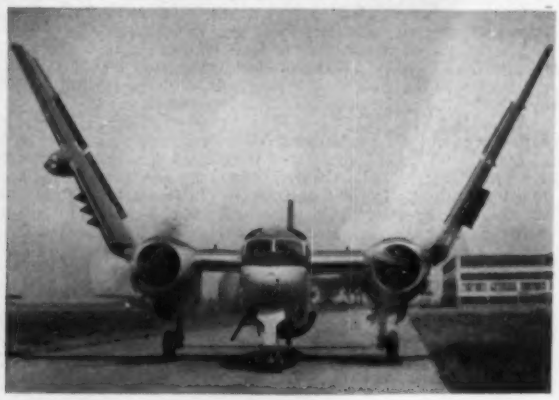
Canadian production of the D.H.C.1 Chipmunk was re-started last year following an R.C.A.F. order for 60. Deliveries began in February this year and are now approaching completion.

The engine division is at present concentrating on the overhaul of Orenda engines, turning out an average of 30 per month. A total of 82 Gipsy Majors have been overhauled and converted in connection with the R.C.A.F. Chipmunk order, and the assembly of CS2F powerplants (cowlings and mountings from Bristol Aircraft (Western) at Winnipeg; engines and airscrews from Canadian Pratt and Whitney at Montreal) is proceeding in time with the assembly-line flow of the aircraft. Other work performed by the engine division includes the overhaul of Goblin and Ghost turbojets, Gipsy Queen piston engines, and airscrews for Bristol Freighter, Dove and York aircraft.

The guided missile division has made much progress in equipping various types of aircraft for new defensive rôles and in providing functional packages for use in missiles. In particular, it has contributed to the Velvet Glove project and is expected to participate similarly in the reportedly forthcoming Sparrow 2 programme. The division has also carried out system develop-

Spraying of D.H.C. Otters in de Havilland's modern paint shop.

The first Canadian-built CS2F, which made its first flight in May.



Lockheed P2V-7 Neptunes in the Fairey plant at Eastern Passage.

ment work on the electronic equipment installed in the CS2F-1. The floorspace occupied by the division is now about to be more than doubled.

Probably the most interesting civil project under way at Downsview is the twin-engined D.H.C.4. No details have yet been released by the company concerning this design which, it is reported, is aimed particularly at rugged, simple construction and short landing and take-off performance. The machine is believed to incorporate a high wing with double-slotted flaps, and rear loading ramp; and to accommodate about 30 passengers. Construction of the first D.H.C.4 has not yet begun, but a full-scale mock-up of the machine has been completed, and a large amount of engineering effort has already been put into the project.

The total number of employees has increased over the past year to about 4,000, of whom 200 work in the engine division and 200 in the guided missile division. With Sir Geoffrey de Havilland as president, the executive head at Downsview is P. C. Garrett, vice-president and managing director.

THE FAIREY AVIATION COMPANY OF CANADA, LTD.

A CHANGE in emphasis to new aircraft types at Eastern Passage, Nova Scotia, and a widening of activity at the new west-coast plant at Patricia Bay, have been two main trends in Fairey activity in Canada over the past twelve months. For many years associated with the Royal Canadian Navy, the company's range of work is now being extended.

At Eastern Passage, the company's main plant has begun an extended modification programme on R.C.A.F. P2V-7 Neptunes, in addition to the existing modification work on R.C.A.F. Lancasters. The maritime reconnaissance Lancasters, it seems, will continue until the CL-28 is in operational use. For the Navy, overhaul and repair work has switched from Sea Furies to Banshees. Although the first CS2F has yet to be formally delivered to the R.C.N., the start of an operational modification programme on this type, we learned, is imminent. In the meantime, however, there are still Avengers to be seen in the Fairey hangars.

The design and manufacture of nosewheel and bomb-door actuators for the CL-28, and hydraulic components for the CF-105, has supplemented the continued production of Fairey Hydroboosters for the CF-100 at the main plant during the past year.

At Patricia Bay, B.C., the addition of a considerable amount of varied overhaul and repair work on private and executive aircraft to the original R.C.N. contracts has resulted in the acquisition of a second hangar. The covered floorspace at Patricia Bay now totals 100,000 sq ft, and equipment purchases total $200,000. At present the company's work-load here is divided equally between naval and civil aircraft, but the growing emphasis is on the latter.

With the main-plant buildings now covering 230,000 sq ft, a further building extension of 25,000 sq ft is in the planning stage. The increased volume of work during the past year has been reflected in an increase in personnel: approximately 1,000 people are now employed at Eastern Passage, with a further 100 at the west-coast base. An interesting possibility now being considered together with the parent company at Hayes is that of a Canadian sales tour of the Fairey Ultra-light helicopter later this year. This machine would be particularly valuable in Canada, the company believe, for specialized applications such as fire-spotting.

Managing director of Fairey Aviation of Canada is C. E. Hibbert, M.B.E.

FLEET MANUFACTURING, LTD.

A WIDE variety of work was under way at the Fleet plant at Fort Erie when we visited the company recently. Among the new contracts this year were seen the production of wheel/ski assemblies for the D.H.C. Beaver, and of 115 sets of wing extensions for the Mark 5 version of the Avro Aircraft CF-100; and the design of a mobile systems-training unit for the CS2F-1.

Production of flaps, ailerons and rocket pods for the CF-100, and of bomb-bay and nose-bay doors and escape hatches for the CS2F, is continuing. Other CS2F work is being carried out for Enheat Aircraft (plastic components) and CanCar (slats and spoilers). Tooling for CF-105 details and assemblies (and the first sets of components themselves) is now being produced, and another recent manufacturing programme is concerned with honeycomb floors for Beavers and Otters.

The facilities of the plastics department have been expanded this year—and indeed the overall volume of work at the Fleet factory has increased by 20 per cent over that of last year. In addition to its subcontract production for the big aircraft companies (and for many non-aviation concerns) the company is now performing more work directly for the Canadian government.

During the year, the Helio Courier (for which Fleet holds Canadian and Commonwealth manufacturing and sales rights) has been demonstrated to the Canadian Services, including a recent evaluation by Army units at Wainwright, Alberta. Modification of the prototype being carried out at Fort Erie at

Overhaul, repair and modification of the Royal Canadian Navy's Banshees is now being carried out by the Fairey Company.

the time of our visit was intended to lead to an increase in the certified normal gross weight from 2,800 lb to 3,000 lb. The remaining five machines of the Fleet-manufactured batch have now been sold.

President and general manager of Fleet Manufacturing is H. L. Eberts; other senior executives include N. E. Butler (secretary-treasurer), P. A. Chamberlain (contracts administrator), T. B. Daniels (manufacturing manager), H. Anderson (manufacturing service manager) and H. Louis (new products engineer).

Doman-Fleet Helicopters, Ltd., is a jointly owned subsidiary of Fleet Manufacturing and Doman Helicopters, Inc., which was formed to market the Doman LZ-5 helicopter in Canada and the Commonwealth. The type certificate and C. of A. for the Canadian-built demonstrator were granted earlier this year, since when project work has been progressing at Fort Erie on the adaptation of the Lear "Nafli" (natural flight instrument) system for use on the LZ-5. This and other blind-flying aids are being fitted to the Canadian machine, which is due to be demonstrated for both Service and commercial users. Co-ordination with production specialists of the Doman company is taking place prior to production of the LZ-5 at Fort Erie. Doman-Fleet Helicopters, Ltd., is headed by G. S. Doman (chairman) and H. L. Eberts (president); N. E. Butler is secretary-treasurer and W. H. D. Hanchet is contracts and service manager.

Left, the Helio Courier of Fleet Manufacturing undergoing wheel-ski tests earlier this year. Above, the Doman-Fleet LZ-5 helicopter was used to deliver a birthday cake on the occasion of the 21st anniversary meeting of the Air Industries and Transport Association of Canada.

ROLLS-ROYCE OF CANADA, LTD.

THE production contract for 900 Nene 10 engines for Canadair-built T-33 Silver Star aircraft has been completed on schedule during the past year, a total of fifty Canadian-built engines having been delivered.

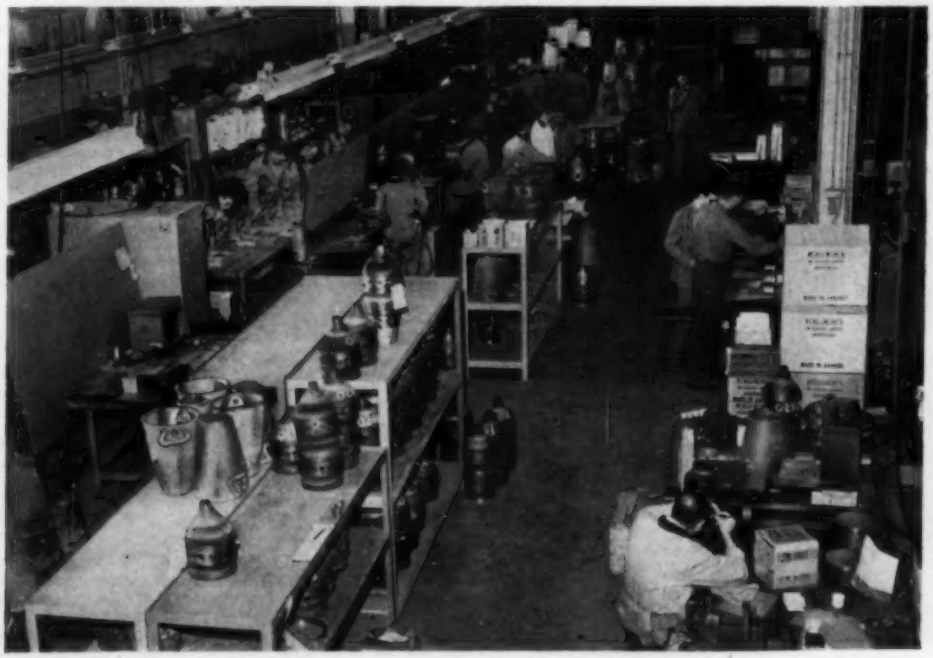
Nene overhaul work and the manufacture of spares continues. The overhaul life of the Nene 10 has been maintained at 750 hr during the year, and as a result of the examination of a number of engines at this life it is expected that approval for an extension to 1,000 hr will soon be given.

The Dart engine now in service with T.C.A., Capital, B.W.I.A., Cubana and the Canadian Department of Transport has completed its first million hours on airline operations, and the Department of Transport has given approval for a 1,400 hr life between overhauls. Meanwhile the Merlin engine continues to give good service with T.C.A. and the R.C.A.F. and over two million engine-hours have been completed on T.C.A.'s Merlins alone.

A recent development was the beginning of overhaul work on the Westinghouse J34 turbojets in service with the Canadian Navy's Banshees, as forecast in last year's Commonwealth issue.

During the last 12 months additional storage space has been provided at the company's plant on the Cote de Liesse Road, Montreal, and the provision of further additional office space is planned for the immediate future.

The total manufacturing, office and stores space is at present 75,000 sq ft and the number of employees engaged on aircraft work is now approaching 600. The general manager of Rolls-Royce of Canada is R. M. Kendall.



Part of the sheet metal shop at the Rolls-Royce of Canada plant at Montreal.

The Canadian Industry

COMMONWEALTH AVIATION

Aircraft Industries of Canada, Ltd.

SITUATED at St. John's Municipal Airport, some 30 miles south-east of Montreal, Aircraft Industries employs a total of 400 people. Their work consists mainly of complete overhaul, modification and conversion of Dakota, PBY and Harvard aircraft for the R.C.A.F., and the overhaul and conversion of all types for commercial and executive operators.

An additional steel-and-concrete hangar is now being erected which, when complete, will raise the total floorspace to some 120,000 sq ft. An extension of runways at St. John's to permit the operation of heavier twin- and four-engined aircraft is planned.

President and general manager of Aircraft Industries is J. H. Lucas.

The heading picture shows the Scarborough, Ontario, plant of Lucas-Rotax. Below, the prototype of the CF-100 flight simulator and weapons-system trainer produced by Canadian Aviation Electronics.

ANCILLARY COMPANIES

Aluminium Company of Canada, Ltd.

ALCAN continues to be a major supplier of aluminium and aluminium alloys in semi-fabricated form to the Canadian aircraft industry. The company's products used by the industry include sheet, tubing, extruded shapes, rod and bar in aluminium; and forgings and castings in both aluminium and magnesium alloys.

In April of this year the appointment of A. W. Whitaker, Jr., as executive vice-president and general manager; and of McNeely DuBose as executive vice-president, were announced. President of the company is R. E. Powell.

Aviation Electric, Ltd.

MOST obvious change since our previous visit to A.E.L. last year was the completion and occupation of the second-storey extension which was then under construction. Office, engineering and development personnel have now moved into this new accommodation, where there remains space for further expansion.

A number of other significant changes have taken place at Aviation Electric during the last twelve months. Mr. Alfred Bandi, president of the company, announced that the Bendix Aviation Corporation had acquired an interest in A.E.L., who would now operate in Canada as a Bendix affiliate. Thus the Canadian company now handles the Canadian sales of Bendix aircraft and marine products. This affiliation means, in effect, that Aviation Electric now has available the latest engineering and production techniques of the Bendix Company—a useful source of highly skilled technical support and extensive research facilities.

In addition to this step, the company have opened a Toronto office, established a modern electronic repair shop at the main plant in Montreal, and opened a marine electronic repair shop and sales office in Halifax, Nova Scotia. The expansion of the engineering department has continued, and Aviation Electric can now design and develop new products required by the Canadian market in cases where suitable items are not available from the various Divisions of the Bendix Aviation Corporation.

Canadian Aviation Electronics, Ltd.

DURING the last twelve months an important period of consolidation has begun for Canadian Aviation Electronics. The design of the CF-100 flight simulator and weapons-system trainer has been successfully completed, the prototype installation having

ANOTHER TCA FIRST

Light weight and low fuel consumption in relation to thrust, with reduced jet noise, are features of the high-powered Rolls-Royce Conway by-pass engine.

TCA ORDERS DOUGLAS JETS WITH ROLLS-ROYCE ENGINES

Trans-Canada Air Lines—first with the Vickers Viscount in North America—once again leads the way in commercial aviation. Canada's National Air Line has announced that it has ordered Rolls-Royce Conway by-pass engines to power its four new Douglas DC-8 jet transports.

A Revolution in Air Transport The DC-8, which will come into regular TCA service during 1960, will carry 120 passengers in both Tourist and First Class, in addition to three tons of cargo. It will cruise at 35,000 feet at approximately 550 miles per hour, completely revolutionizing trans-Atlantic and trans-continental schedules. Flight in TCA's new jet airliners will be smooth, quiet and vibrationless, giving the air traveller a new standard of comfort and convenience.

Viscounts Prove Their Popularity TCA has also announced the purchase of eleven more of the popular Vickers Viscount turbo-prop airliners. Deliveries of the new order of Viscounts will commence in mid-1957 and when completed, TCA's turbo-prop fleet will total 36.

$40,000,000 Investment in the Future These two latest orders add up to a total investment of $40,000,000 in the most modern and technically advanced equipment being built. They also represent a major investment in TCA's future and a solid faith in the British aviation industry. With this investment TCA stands on its determination to stay in the forefront of the aviation world.

TRANS-CANADA AIR LINES

ONE OF THE WORLD'S GREAT AIR LINES

keeping clear

The safety of civil aircraft depends upon the co-ordinated control of civil and military air traffic. To maintain this control in today's congested skies it is vital that *every* pilot should know *exactly* where he is, *every* moment he is in the air. Only the Decca Navigator can give pilots this absolute certainty of position. Throughout the flight the Decca Navigator plots the aircraft's actual track visually, second-by-second, at all heights under all weather conditions. With the aid of the Decca Navigator, aircraft civil and military, can go their separate ways in safety.

You always know where you are with **DECCA**

THE DECCA NAVIGATOR COMPANY LTD., LONDON

The Canadian Industry...

Instrumentation modification of CF-100 tip-tank (Computing Devices of Canada).

been accepted by the R.C.A.F., and production units are under construction.

The news that the R.C.A.F. had placed an initial contract with the company for the supply of SARAH equipment was announced at the time of the A.I.T.A. meeting in Quebec City last autumn. The Service expects to be fully equipped with SARAH this year. While continuing to act as Canadian distributors for the Ultra Electric company in this regard C.A.E. is now devising additional SARAH accessories, such as an automatic crash-position indicator, to make it more useful under Canadian conditions.

In January of this year the first VOR airway installation in Canada, manufactured by C.A.E., was opened by the Minister of Transport at Dorval Airport. Other developments in the Company's activities have included the marketing of a new series of nuclear instruments employing transistor techniques; and negotiations with a number of foreign countries for licence arrangements concerning C.A.E. patents—a reversal of the usual trend—in the fields of automation and nucleonics.

Among the design studies completed by the company, whose president and managing director is K. R. Patrick, O.B.E., are those for a guided weapon for the R.C.N., a DC-6B flight simulator for C.P.A.L., and a DC-8 flight simulator for T.C.A.

The radar fire-control programme continues to make up a large proportion of the company's aeronautical business, and there has been a marked expansion of the instrument and gyro section. One outcome of the CF-100 simulator programme has been the acquisition of new servo and computor techniques, following the need to improve those servomechanisms which simulate the fire-control radar and weapon systems. Previously, the lost motion in ordinary gear trains and the response time of ordinary servo amplifiers and motors had made it impracticable to duplicate faithfully the radar 'scope presentation, although a high degree of accuracy and response existed in the original servomechanisms used for flight, engines and miscellaneous systems.

Of incidental interest during the past year are the facts that the CF-100 simulator has been interviewed by the Canadian Broadcasting Company, and has been flown (and crashed) by *Flight*.

Canadian Marconi Company

IN addition to sales and service for the English Marconi company, Canadian Marconi are now carrying out the design and development of aircraft radio equipment and the design of complete aircraft installations. Production activity is at the main factory at Trenton Avenue, Montreal, while development laboratories and sales office are located in the company's new building at Outremont, Montreal.

During the past year the company has developed a new ADF which is light in weight yet with major airline performance (and which has successfully completed trials with the Canadian Services); a new transistorized loud-hailer (100 watts output, only 50 lb in weight); and new audio transistorized units including cockpit loudspeakers. Canadian Marconi is under the executive direction of S. M. Finlayson, president; and J. J. Kingan, vice-president and general manager.

Computing Devices of Canada, Ltd.

IT was in a smart new plant at Bells Corners, near Ottawa, that we renewed our acquaintanceship with Computing Devices. The move to the new head office and plant was made late last year, since when the total floorspace has been increased to 82,000 sq ft, about one-third of which is devoted to aircraft work (primarily instrumentation development and guided weapons). Official opening of the new plant was performed by Mr. C. D. Howe in June of this year.

The Mk IIB version of the company's Position and Homing Indicator, the first push-button automatic dead-reckoning instrument of its type for single-seat aircraft to be developed, is now in production. It is in use with the R.C.A.F. and the U.S.A.F., and negotiations are under way with several other NATO Air Forces.

The ANTAC project, on which C.D.C. is working in co-operation with the R.C.A.F., has been described as a development which may be of great significance in the field of aircraft instrumentation. It involves the design of a complete Air Navigation and Tactical Control system for the Canadair CL-28 aircraft intended for Maritime Air Command.

Another current project at Bells Corners is the conversion (designed and carried out by the company) of standard CF-100 wingtip tanks into instrument-carrying installations for use in aircraft and missile testing. Known as the universal instrumentation package, the tank in modified form carries two motion-picture cameras, an 18-channel recorder, gyros, and a radio receiver.

There are at present just over 500 employees of C.D.C., of whom some 50 per cent are directly or indirectly concerned with aircraft work. Executive head of the company is C. F. Hembery (president and general manager) while J. Stuart Parsons is technical director and chief engineer. For the future, further expansion is planned: work has already begun on a new building of 75,000 sq ft on the Bells Corner site, for occupation next January.

Collins Radio Company of Canada, Ltd.

AN emphatic expansion from 15 employees in early 1955 to a current total of 275 (200 of whom are working on aviation electronics) has taken place at Collins of Canada, which is a subsidiary of Collins Radio Co. of Cedar Rapids, Iowa. The main plant at Toronto now houses a manufacturing section, in addition to sales, engineering and research and development groups.

Floorspace has been increased from 20,000 to 55,000 sq ft., of which 35,000 sq ft is devoted to aircraft work. The expansion of activity is likely to lead to further physical expansion in the not-too-distant future, and an additional sales office is already operating in Vancouver. Vice-president of the company is M. W. Burrell.

Cossor Canada, Ltd.

EMPLOYING 200 people in its Halifax main plant and Montreal and Toronto branches, Cossor Canada is responsible for advanced electronic development and production. Current products include airborne radar defence equipment, aircraft intercommunications systems, advanced display systems (radar and computors) and test gear. Repair, overhaul and special-installation work is also carried out. Director and general manager is A. C. Carter.

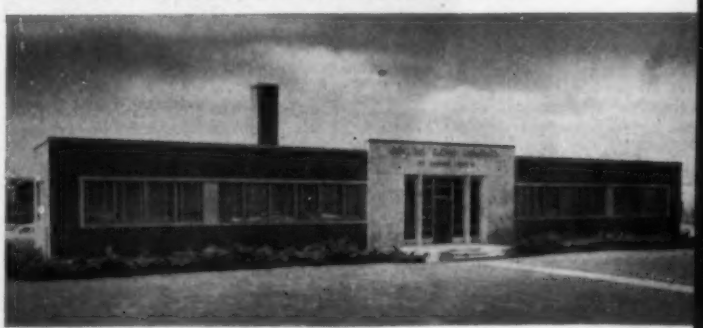
Decca Companies in Canada

SINCE December 1954, **Decca Navigator (Canada), Ltd.**, have been responsible for the sales, installation and service of the Decca Navigator system for air navigation and air survey. Trials are being carried out by Spartan Air Services and the Department of Mines and Technical Surveys.

Decca Radar (Canada), Ltd., (the original Canadian Decca company) sell, install and service radar systems in Canada, including marine, airfield control, airfield surveillance, storm warning, harbour and defence systems.

General manager of both companies is L. J. Dennet.

The Toronto plant of Collins Radio Company of Canada.



The first CS2F-1 tail-unit set to be produced by Enheat Aircraft.

Mr. D. N. Kendall (right), vice-president of Hunting Associates.

The Canadian Industry...

Dowty Equipment of Canada, Ltd.

THE major portion of Dowty's current development effort is concentrated on the CF-105 main undercarriage, which is now in the process of intensive testing. Several sets are being produced. Manufacture of the Bendix nose undercarriage for the CS2F-1 is well under way and is continuing; and work on an undercarriage proposal for the D.H.C. 4 has been carried out.

The CF-105 work has introduced the company to many problems in the procurement, fabrication and processing of ultra-high-strength steel for, while the undercarriage is as advanced technically as any in the U.S.A., correspondingly complete production facilities are not available in Canada. Among other recent projects have been afterburner components for the Orenda 14.

Development facilities at Dowty's South Plant at Ajax have been further expanded over the past twelve months, and a smaller guillotine-type rig has been added to complement the main parallelogram-type drop-test unit. The main and guillotine rigs are respectively designed for drops of 18 ft/sec and 7,500-75,000 lb load; and 25 ft/sec and 1,500-10,000 lb load. Among new environmental-test facilities is a test chamber capable of producing temperatures from minus 100 deg F. to plus 300 deg F.

With more engineering staff and rather fewer on the production side, compared with last year's figures, Dowty's employment total is now just under 400. About 80 per cent of production work is subcontracted, in line with the company's policy of maintaining a steady employment level. A number of Dowty representatives have been stationed at the weapons range at Cold Lake, in connection with the company's components (and those of Dunlop) fitted to the CF-100.

During the year, R. F. Hunt, Dowty Canada's president, has been appointed to the Board of the parent group, and I. M. Hamer is now vice-president and general manager. R. MacIntyre, previously with de Havilland Canada, has joined the Dowty company as director and assistant general manager.

Enheat Aircraft

ENHEAT Aircraft, the aircraft division of Enamel and Heating Products, Ltd., of Amherst, Nova Scotia, is engaged on sub-contract production of complete tail units for the CS2F-1 anti-submarine aircraft for de Havilland Canada, and is also to build the rear-fuselage sections of these machines. Baffles for the Wright R-1820 engines produced by Canadian Pratt and Whitney for this aircraft are also manufactured by Enheat.

Other work at present includes the overhaul and maintenance of components for R.C.A.F. Lockheed P2V-7 Neptunes, cannibalization of the Service's Lancasters, and miscellaneous other contracts for manufacture, repair and overhaul.

Enheat facilities at Amherst cover a floor space of 150,000 sq ft, and 325 people are employed there. The president of Enamel and Heating is N. A. Hesler, and W. J. Wienand, Jr., is vice-president in charge of the aircraft division.

Godfrey Engineering Co., Ltd.

AFFILIATED with Sir George Godfrey and Partners, Ltd., of Hanworth, Middlesex, this company continues its work on the manufacture of air-conditioning equipment for aircraft, including cabin superchargers and cold-air units. The design and manufacture of ground servicing equipment is also carried out. North American aircraft utilizing Godfrey equipment include the Viscounts of T.C.A. and Capital.

Hunting Associates, Ltd.

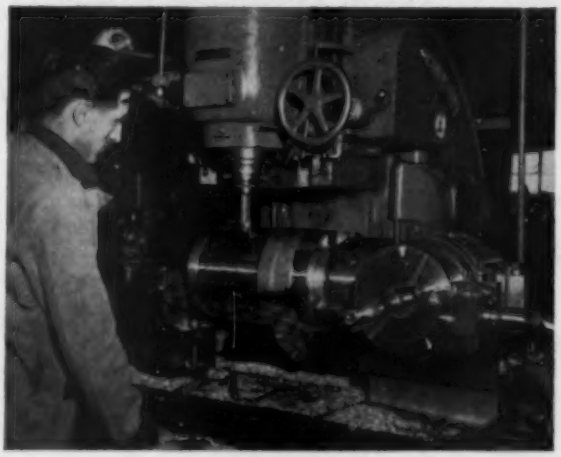
IN May of this year the Hunting group of companies in Canada celebrated its tenth anniversary. It had grown from one Toronto air-survey company with five employees, to a group of seven companies employing 850 people and engaged in the fields of air survey, geophysics, instrument manufacture, aircraft operation and aircraft overhaul from bases across Canada. The man who in 1946 had come over to Canada, negotiated an air-survey contract with the Ontario government and thus started this development is D. N. Kendall, now vice-president of the holding company, Hunting Associates, and of two of the member companies; and president of the other four. It is difficult to summarize completely the many varied activities of the various member firms; below are noted their functions, together with some of the main recent developments.

Aeromagnetic Surveys, Ltd.—World-wide airborne geophysics services. Work done by A.S.L. during the last twelve months has been three times that of the previous year, and staff and facilities both at Toronto and at Oshawa have been increased. Since January, a combined electromagnetic detector (EM) and scintillometer installation has been flown in a helicopter, and a current development is to add the third (strictly speaking, the first) of the company's mineral-hunting aids, the airborne magnetometer, to this helicopter installation. The fixed-wing EM installation is now being used by Hunting Geophysics of Boreham Wood (probable areas of application are Europe and Africa), and another such installation is being flown to Australia. General manager of A.S.L. is D. G. MacKay.

Field Aviation Co., Ltd.—Aircraft maintenance and overhaul; aircraft and aircraft parts; agency sales and service. Primarily concerned with the maintenance, overhaul and special-purpose modification of Kenting's aircraft fleet, Field also performs maintenance work for the R.C.A.F. both at the company's Oshawa base and at Service stations. The two Cansos used in the Antarctic earlier this year by Hunting Aerosurveys were fitted out by Field prior to the expedition. On the agency sales side, business has expanded and sales offices have been opened in Vancouver, Winnipeg and Ottawa.

A recent agreement with Timmins Aviation has resulted in Field becoming the Ontario agents for the Piaggio Royal Gull amphibian. For the future, George Suarez (general manager) forecasts an expansion of Field effort—both sales and maintenance—linked to the growth of executive flying in Canada.

Dowty at Ajax: end-milling cam track profile on torque fitting of main undercarriage of Avro supersonic aircraft—clearly the CF-105.

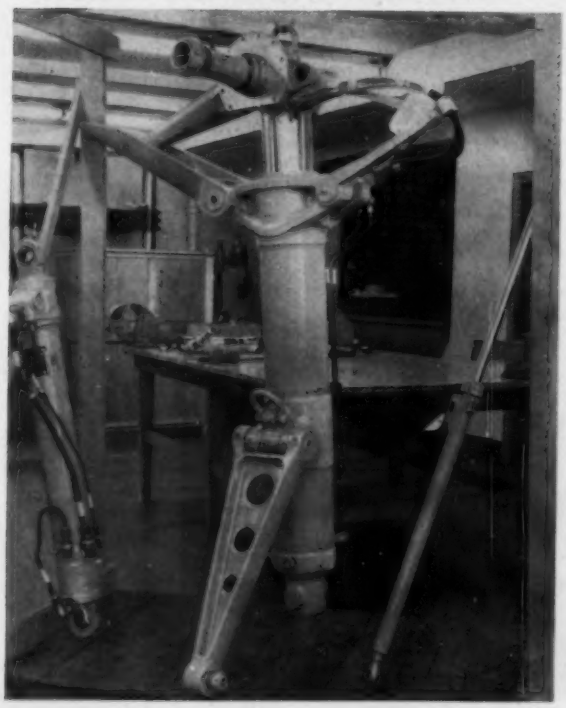


Kenting Aviation, Ltd.—Operators of aircraft for aerial surveys and other technical flying. By contributing two Canso survey aircraft as part of the United Kingdom expedition to Antarctica earlier this year, Kenting now claim to be the first operator in the world to have carried out operations in all seven continents. Two Kenting Hudsons were used in the P.S.C. surveys reported below. Manager of the company is A. F. Soutar.

The Photographic Survey Corporation, Ltd.—Aerial surveyors and photographers; photogrammetric engineers; natural resources surveyors. Important contracts during the last year have included a comprehensive resources survey of Ceylon for the Canadian government under the Colombo Plan; and a topographical mapping survey of the Caroni river in Venezuela for the Venezuelan government. Largest current project, however—claimed to be the largest survey of its type in the world—is "Operation Overthrust," a geological study of some 357,000 sq miles of aerial photography of the mining areas of the Pre-Cambrian Shield in Canada and the U.S.A. Vice-president and general manager of P.S.C. is W. H. Godfrey.

(Right) EM/scintillometer "bird" devised by Aeromagnetic Surveys, Ltd., for helicopter use, here being employed with a Bell 47.

Above, P.S.C. Applied Research, Ltd., auroral recorder, and temperature chamber of environmental-test laboratory. Below, CS2F main landing gear by Jarry Hydraulics.



Photographic Surveys (Quebec), Ltd., is another associate company (with headquarters in Montreal) in the Hunting group, covering the same type of work as P.S.C. President and managing director is P. F. Osler.

P.S.C. Applied Research, Ltd.—Specialists in electronic, electromechanical and mechanical instrumentation. The environmental-test laboratory described in last year's Commonwealth issue was officially opened in May of this year. The R-Theta navigational computor is now in production for the R.C.A.F., is undergoing evaluation trials in the U.S.A. and U.K., and is under consideration by other NATO countries. Other recent products include an airborne profile recorder, a production version of the Gamble stereo plotter, and an auroral recorder which will be used in measurements of the Aurora Borealis during the International Geophysical Year. Managing director of A.R.L. is J. M. Bridgman.

International Nickel Company of Canada, Ltd.

LAST year marked the fiftieth anniversary of Canada's leadership in world nickel production. Deliveries by International Nickel averaged over 24,000,000 pounds of nickel per month, or 290,000,000 pounds for the year. This was a record total, representing over 65 per cent of the free world's supply. Copper is the company's second most important product, deliveries of refined copper having increased by almost 10,000,000 pounds to a total of 263,000,000 pounds last year.

The company's current aircraft products include alloys for high-temperature service blading of British gas-turbines; modifications of Inconel, as well as the Nimonic alloys, for blading in Canadian-built turbojets; and Ninomic and Inconel flame-tubes. President of International Nickel of Canada is Henry S. Wingate.

Jarry Hydraulics

ESTABLISHMENT of a full environmental-test service and a continued expansion of design and production facilities have taken place at Jarry's Montreal plant during the last twelve months. The prospects there have never appeared brighter for this enthusiastic all-Canadian company, which has risen to its present responsible position in only five years from its date of formation.

The first undercarriage for the CL-28 was completed in the short time of five months, and the initial batch of CS2F main undercarriages has also been completed. The prototype nose landing-gear of the CF-105, and other components of this aircraft, are now at the testing stage.

The major part of the company's engineering effort at present is going into the CF-105; a high proportion of this aircraft's hydraulic equipment being by Jarry. The firm is also entering the high-temperature field of afterburner actuators in connection with the Orenda.

A new drop test rig is now available for landing gear of aircraft up to 200,000 lb a.u.w. Incorporated in the rig is a 12ft diameter drum rotating at peripheral speeds up to 150 m.p.h. on which full shimmy and steering tests can be made. In addition to full environmental-test facilities which have been installed during the year, a complete manufacturing shop for wheels and brakes is now in operation. The company is now making all Bendix wheels and brakes manufactured in Canada.

The overhaul and repair of T.C.A.'s North Star and Super Constellation undercarriages continues, and a new building is being constructed to house this section. More land is being acquired behind the present main plant, and among the new facilities to be built there (in addition to the overhaul and repair block) are an electric power sub-station and a new warehouse for raw material.

The president of the company is Fernand Jarry.

The Canadian Industry...

Part of the kerosine test-house at the Lucas-Rotax plant at Scarborough.

Lucas-Rotax, Ltd.

A NEW engineering development building of 25,000 sq ft was seen to be at an advanced stage of construction at the time of our visit to Lucas-Rotax this year. Costing over one million dollars, the new block is expected to be complete this autumn.

The design side of the company's work has continued to expand, and 120 staff are now employed in this field. Projects have included a fuel system for the Iroquois (prototype sets have been produced); generating system and other electrical equipment for the CF-105; controls for Orenda re-heat; generating system for small aircraft; hydraulic constant-speed drives (primarily guided-weapon applications); hydraulic and electrical supplies power-pack for guided weapons; and air turbine-driven centrifugal fuel pumps (primarily for the Iroquois).

The existing facilities comprise the main design, manufacturing and testing plant at Scarborough, outside Toronto; and an overhaul and repair plant at Montreal. Further expansion is planned.

The general manager of Lucas-Rotax is R. C. Padget.

Noorduyn Norseman Aircraft, Ltd.

THIS company continues to carry out overhaul and repair of Noorduyn Norseman 8/10-seater transport aircraft, and to manufacture spare parts for the type. In addition, the firm now has Canadian representation for Eastern Rotorcraft, Inc., manufacturers of cargo nets, and Ledkote Products of New York, Inc., makers of exhaust collectors. The president is R. B. C. Noorduyn.

Normalair (Canada), Ltd.

ETOBICOKE, on the outskirts of Toronto, is the home of the Canadian Normalair company. Facilities include a test and assembly shop, with equipment for overhaul and production of pressurization and flow-control units; in addition, the machine-shops of the adjacent A. C. Wickman Company, with whom Normalair (Canada) are associated, are available.

Since last year prototype orders have been obtained for new aircraft being developed in Canada, and schemes are being considered to provide service, overhaul and liaison for the Normalair equipment on the Britannia aircraft of C.P.A.L. which are expected next year, in addition to that of the North American Viscounts.

Northwest Industries, Ltd.

AMONG the many visits to Canadian firms by *Flight* this year, none was more stimulating than that to Northwest Industries at the busy hub of northern flying that is Edmonton Airport. The main development at Northwest over the past year has been the introduction of a commercial aircraft service, and with this has come a steady increase in the proportion of civil aircraft handled. The major portion of work, however, is still concerned with R.C.A.F. contracts.

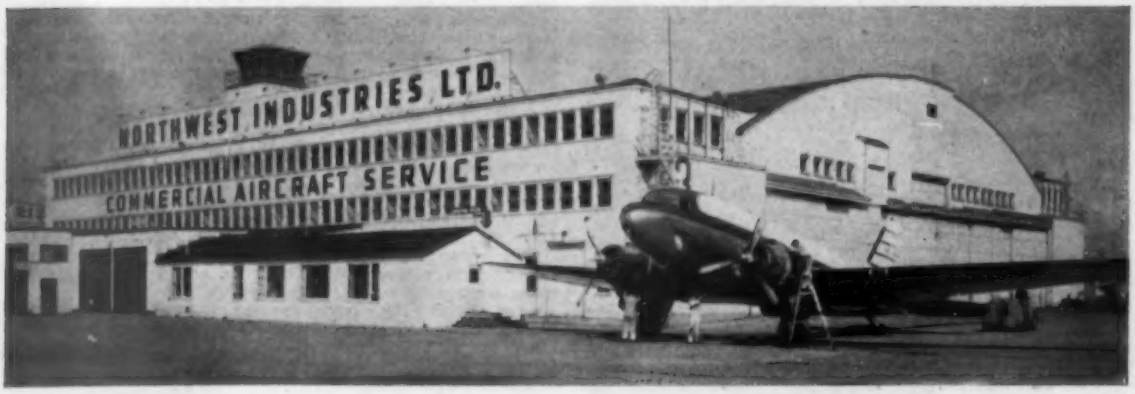
The company's main plant, covering 230,000 sq ft on the north side of the airport, carries out the repair and modification of R.C.A.F. T-33 Silver Stars, C-119 freighters, C-47 Dakotas, and Harvards, and the firm is authorized by Douglas as a service centre for DC-3s and C-47s. One major disaster during the year was the destruction by fire of the company's modern instruments and electronics laboratory. Most of the instruments and test equipment were salvaged in an undamaged condition, however, and temporary accommodation for the laboratories is now being used until the occupation of a new, fireproof building which is to be erected later this year.

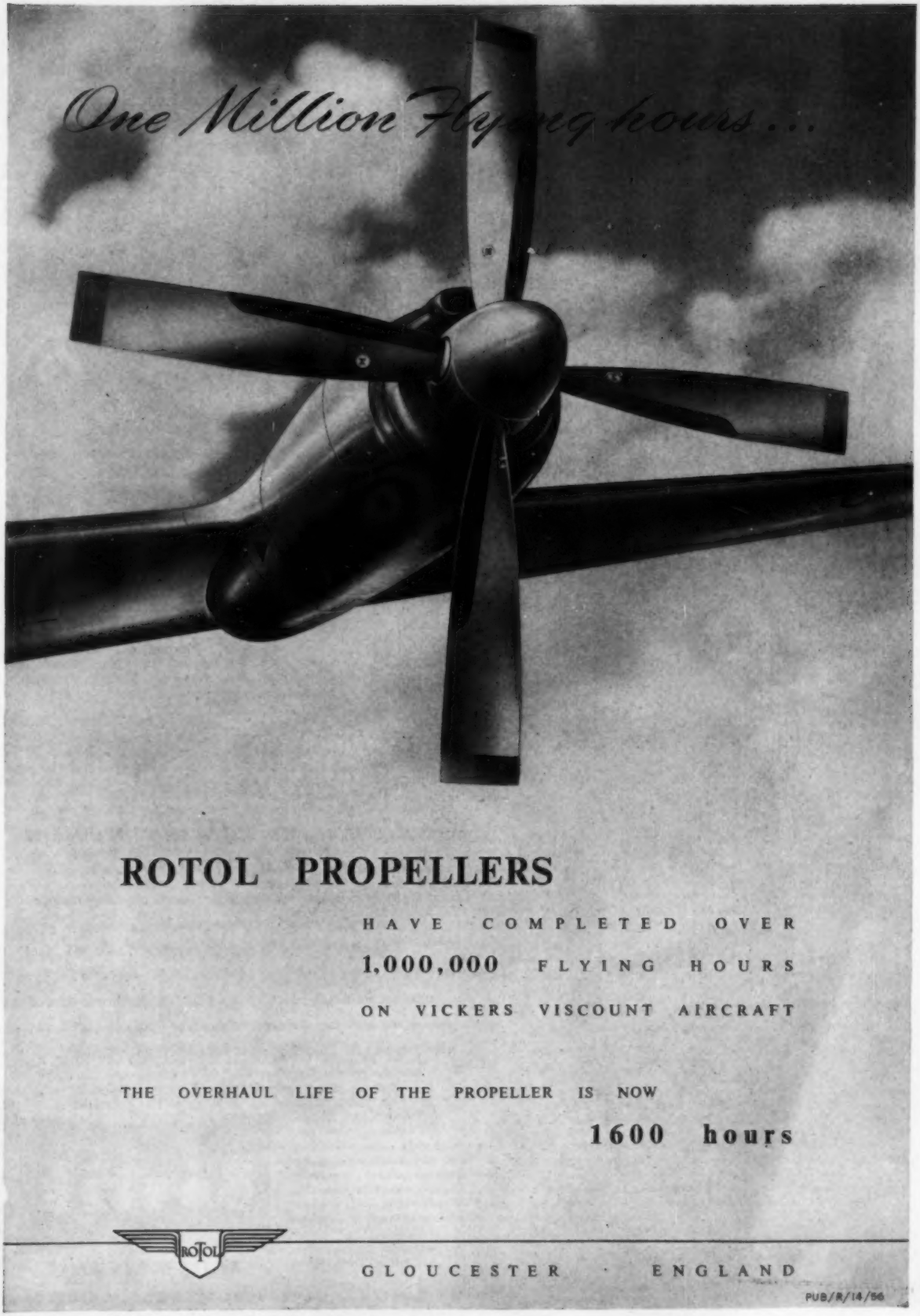
The new "commercial aircraft service" hangar (below), with the flight hangar, is located on the east side of the airport. Here are provided full maintenance, repair, overhaul, servicing, modification and conversion facilities for the many civil operators whose base or port of call is Edmonton. These include oil and pipeline operators, owners of executive aircraft, commercial airlines and freight carriers to the far North; and among the services provided are "airline terminal" lounge facilities and full weather and flight-planning information. With the increase of staff resulting from this widening of facilities, the employees of Northwest Industries now total 800.

The engineering office of the company has doubled in size over the past twelve months, and staff numbers here are still increasing.

A progressive long-range step by Northwest has been the endowment of a $10,000 trust fund at the University of Alberta for fundamental research into the use of transistors in airborne electronic equipment. Executive head of the company, whose president is Francis G. Winspear, is B. W. Pitfield, vice-president and general manager. W. R. Whitaker is secretary-treasurer and G. L. Best is plant manager.

The new hangar of Northwest Industries at Edmonton Airport where maintenance and modification of civil aircraft is carried out.

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The Canadian Industry...

The Renfrew plant of Renfrew Aircraft and Engineering Company, Ltd.

Phoenix Engineered Products, Ltd.

EMPLOYING approximately 300 people, this Toronto company carries out the repair and overhaul of aircraft instruments for the R.C.A.F. and R.C.N.; and the manufacture and development of aircraft instruments and fuel booster-pumps.

Prenco Progress and Engineering Corporation, Ltd.

OCCUPYING some 72,000 sq ft of machine-shop area, in addition to warehouse space, in Toronto, Prenco has continued to design and produce hydraulic controls and ground equipment for the R.C.A.F. and for Canadian civil operators. Plans have been announced for the construction of a new 40,000 sq ft factory at Uxbridge, Ontario.

President and managing director of the company is J. K. Chmel.

Pye Canada, Ltd.

SITUATED at Ajax, 22 miles from Toronto, Pye Canada is concerned with all products of the Pye Group which have market application in the Dominion. These are divided into five groups: radio communications, telephone apparatus, scientific instruments, television transmission equipment, and domestic radio and television. Pye equipment, including helicopter installations, is used by many air survey and mapping operators in Canada.

R.F.D. (Canada), Ltd.

THIS company, a subsidiary of the R.F.D. company of Godalming, Surrey, continues to manufacture life rafts, life jackets, towed targets and other types of air/sea rescue equipment; and to repair all types of inflatable life-saving equipment, including marine dinghies. The factory premises, covering 15,000 sq ft, are located at Granby, Quebec, and the president of the company is R. E. Lloyd.

Renfrew Aircraft and Engineering Company, Ltd.

FORMED in March, 1955, to acquire the business of Cockshutt Aircraft, Renfrew A. and E. is affiliated with the Lancashire firm of Burnley Aircraft Products, Ltd. With 107,000 sq ft of factory space on a 21-acre site at Renfrew, Ontario, the company is one of the larger manufacturers in Canada of combustion equipment for Orenda and Nene turbojets.

Among the firm's other activities is the design and manufacture of fuel and lubricant-handling equipment for airports. President of the company, which employs some 300 people, is G. E. Woods-Humphery, C.B.E.

Simmonds Aerocessories of Canada, Ltd.

AS exclusive Canadian licensee of Simmonds Aerocessories, Inc., U.S.A., this company has continued to work on the development and manufacture of a wide range of aircraft accessory equipment, in particular on liquid gauging, latches, controls and special fasteners. The company is Canadian representative for Hi-Shear rivets and related fasteners, and also for British manufacturers such as Saunders Valve Co., King Aircraft Corporation and U.S. design and manufacturing organizations.

Executive vice-president of Simmonds Aerocessories of Canada is Sir Oliver Simmonds.

Sperry Gyroscope Co. of Canada, Ltd.

THE first Canadian production programme of A-4 gun/bomb/rocket sights has been carried out by Sperry during the past twelve months. This equipment has been manufactured for the U.S.A.F. and the R.C.A.F. at Sperry's Montreal plant, following an extensive U.S.A.F. order for various types of F-86 spares.

Current products include Gyrosyn compasses for the Services and commercial operators; and Kollsman machmeters, mach/A.S.I.s and 50,000ft altimeters. Also relevant is the widespread use in Canada of the products of the U.S. parent company. The A-12 automatic pilot and Zero Reader flight director are currently in use on C.P.A.L.'s trans-Pacific flights, and engine analyzers are used by T.C.A. in its Super Constellations. Promising new developments are forecast in relation to the Sperry Integrated Instrument System, and the new SP-30 Flight Control System which has been specified for T.C.A.'s forthcoming DC-8s.

Over the past two years the engineering department has expanded to a total of over 50 men. One recent development is a new Gyrosyn compass system, with a drift rate of only one degree per hour, for use in polar regions. This new compass system, it is planned, will go into service with the R.C.A.F. and commercial operators (including C.P.A.L.). Current development work is directed towards the field of jet engine controls, proposals for thrustmeters, synchronizers, temperature- and pressure-measuring devices and other units having been made to the Avro and Orenda companies.

Managing director of the Sperry Gyroscope Company of Canada is B. W. King.

Standard Aero Engine, Ltd.

LOCATED at Stevenson Field, Winnipeg's main airport, Standard Aero Engine have a year of expanding activity to report. Repair and overhaul of a range of some 20 types of piston engine is now proceeding at a monthly rate of between 40 and 50 engines, and the company acts as sales representative for a number of U.S. engine manufacturers.

The second main division of the company is that devoted to aircraft and engine accessories, 400 different types of which are handled, at a rate of about 800 per month. They include starters, generators, ignition coils, control boxes, and hydraulic and pneumatic equipment. A new development during the past twelve months has been the overhaul of turbojet fuel systems, and the installation of comprehensive test rigs for these units.

The president of Standard Aero Engine is E. H. Moncrieff, who is also this year's president of the Air Industries and Transport Association of Canada.

The headquarters of Standard Aero Engine at Stevenson Field, Winnipeg. Both engines and accessories are overhauled and repaired.

Mascot is the name by which Kingsford Smith Airport, Sydney—Australia's largest terminal—is best known. It is claimed to have the best safety record of any airport in the world: not a single life has been lost nor has a serious accident occurred there in the 34 years of its existence.

Australasian Air Transport

THE WORK OF THE SCHEDULED CARRIERS

AUSTRALIAN scheduled air transport operations are maintained by 11 airlines which at September 30 last year had a total domestic route mileage of 101,031. In addition, Qantas Empire Airways had 50,157 miles of international routes.

During the year October 1, 1954, to September 30, 1955, Australian domestic operations totalled 265,030 hours and 45,304,413 miles flown. The number of passengers embarked was 2,004,640; passenger-miles flown were 822,779,051; seat-miles available 1,318,889,191; and passenger load factor 62.4 per cent. Freight carried amounted to 82,563.4 tons, which produced 38,798,458 ton-miles; mail ton-miles were 1,455,961, and the total estimated ton-miles for all scheduled domestic traffic was 122,532,324, a ten per cent increase over the previous year. A further 44,488,492 ton-miles were flown on international services which carried 56,600 passengers and 1,858.4 tons of freight.

Figures forming the basis for the remainder of the Australian section of this article are the latest available, and are for the quarter ended September 30, 1955.

The scheduled domestic airline operators arranged in order of size (based on numbers of passengers carried) are: Trans-Australia Airlines (181,481); Australian National Airways (147,034); Ansett Airways (51,585); Butler Air Transport (34,690); Guinea Airways (20,060); Queensland Airlines (15,984); East-West Airlines (13,063); Qantas Empire Airways (12,830 domestic); MacRobertson-Miller Airlines (formed by merger of MacRobertson-Miller Aviation and Airlines (W.A.), Ltd.) (11,375); Woods Airways (651); and Connellan Airways (243).

The A.N.A. passenger terminal at Brisbane—one of three terminals at the airport—with a DC-6 of A.N.A. standing by.

Trans-Australia Airlines was set up in 1946 as a State enterprise and it has rapidly built itself into the leading Australian domestic carrier. Its decision to purchase a fleet of Viscounts was a most important one, and they have contributed a great deal to the airline's recent successes. The load factors and utilization of these aircraft have been particularly satisfactory under the most competitive conditions.

T.A.A. has 29,095 miles of unduplicated routes and 37,762 miles including duplications. The greatest concentration of routes is between Melbourne, Sydney and Brisbane with lines from Melbourne and Sydney to Tasmania. Further route systems link Brisbane and Darwin, and Adelaide and Darwin. The 1,415 miles from Adelaide to Perth are flown daily by Viscounts in competition with A.N.A.'s DC-6s.

Routes range in length from 87 miles (Sydney to Newcastle) to the 2,249 miles from Sydney to Darwin. In the quarter under review passenger traffic varied from 62 passengers on the Cloncurry - Winton services to 37,055 on the Melbourne - Sydney - Brisbane route. With 21,275 hours and 4,082,100 miles flown the total passenger traffic was 181,481 with an overhaul passenger load factor of 72.8 per cent. Freight tonnage was 5,284.8, mail added 277 tons to the traffic and an overall revenue load factor of 73 per cent was achieved.

At the end of 1955 the fleet comprised six Viscounts, five Convair CV-240s, four DC-4s, 22 DC-3s, four Drovers and one Dragon. Since that time further Viscounts have been delivered, and the Viscount fleet will total 11 Series 700 aircraft and two 810Ds. T.A.A. are disposing of their Convairs.

Australian National Airways is the largest Australian private airline, and this year it celebrates 20 years' operation under its present title. Very severe competition has existed between A.N.A. and T.A.A. during the last ten years. Initially the fight was none too clean when the Socialist Government launched its chosen airline, but both airlines have since developed well and traffic is heavy.

The quarter's traffic figures for A.N.A. and T.A.A. on the Melbourne - Adelaide - Perth route, where DC-6s and Viscounts compete, are extremely interesting. A.N.A. figures (with T.A.A.'s in parentheses) are: passengers carried 10,607 (10,809); miles flown 374,400 (482,200); passenger-miles flown 11,235,800 (11,403,900); seat-miles available 19,393,600 (14,423,000); passenger load factor 57.9 per cent (79.1).

Comparative figures for the same period on the Melbourne - Sydney - Brisbane route were: passengers carried by A.N.A. 37,589 (T.A.A. 37,055); miles flown 504,200 (634,900); passenger-miles flown 19,238,900 (20,196,800); seat-miles available 26,562,200 (22,557,200); passenger load factor 72.4 per cent

(89.5). The high load-factors produced by T.A.A.'s Viscounts are in keeping with those in other parts of the world where the Viscount has been introduced.

A.N.A.'s route mileages are 14,239 unduplicated and 17,944 with duplications. Routes vary in length from the 104 miles between Cairns and Cooktown to such trunk routes as Melbourne - Adelaide - Perth. The Normanton - Koolatah route produced only 169 passengers in the three months, while 37,589 were carried on the Melbourne - Sydney - Brisbane route.

The airline flew in the period a total of 18,197 hours, carried 147,034 passengers and achieved an overall passenger load factor of 56.2 per cent. The total revenue load factor was 63.9.

At the end of 1955 the fleet consisted of two DC-6Bs, two DC-6s, eight DC-4s, 16 DC-3s and three Bristol 170s. Since that time a Bristol 171 helicopter has been commissioned for special duties, and two more DC-6Bs are to be added to the fleet.

Ansett Airways, like A.N.A., is celebrating 20 years of operation. The company has 6,974 miles of routes and it is the only purely domestic Australian airline to operate flying-boats. In 1952 Ansett took over Barrier Reef Airways, and in the following year acquired some of the routes of Trans Oceanic Airways. Both these companies operated only flying-boats. More than 2,000 miles of routes are now operated with Short Sandringhams; the company's other routes are flown by Convair CV-340s and DC-3s.

The shortest route is the 158 miles from Melbourne to Hamilton, the company's original route, opened in 1936; and the longest is the 1,063 miles between Sydney and Hayman Island.

The busiest Ansett routes in the three months up to the end of last September were those betwen Sydney and Brisbane and Melbourne and Sydney, on which 15,699 and 14,283 passengers respectively were carried. In the same period 1,130,200 miles were flown, 51,585 passengers carried, and 2,324 tons of freight and 7.5 tons of mail lifted. The passenger load factor was 59 per cent and the total revenue load factor 71.4.

Butler Air Transport was founded in 1934, acquired control of Queensland Airlines in 1947, and was registered as a public company in 1952. Butler has an unduplicated network of 8,081 miles of routes based on Sydney, the longest being the 1,132 miles to St. George. The shortest route, from Sydney to Bathurst, is 96 miles long. It is this route which in the quarter under review carried the greatest passenger traffic—5,628. The company has a fleet of two Viscounts and a number of DC-3s. The Viscounts have been achieving high utilization and load factors and the airline has installed its own built-in passenger steps, as it did some years ago with its DC-3s.

Butler's traffic figures for the quarter ended September 30, 1955, were 3,990 hours flown, 613,700 miles flown, 34,690 passengers, 630.7 tons of freight and three tons of mail. Total revenue load factor was 78.5 per cent and the overall passenger load factor 61.6 per cent.

Guinea Airways began operations in the New Guinea goldfields in 1927 but more recently has become a comparatively small local operator based on Adelaide and having about 2,000 miles of routes. DC-3s are used on scheduled operations, and traffic figures for the third quarter of 1955 were: 1,551 hours flown, 231,000 miles flown, 20,060 passengers, 336.2 tons of freight and 21 tons of mail. The passenger load factor was 62 per cent.

Queensland Airlines, controlled by Butler Air Transport, has 3,489 miles of unduplicated routes based on Brisbane. Most of these are within Queensland, but there is a small penetration into New South Wales. The busiest route is that between Brisbane and Rockhampton, which carried 3,470 passengers in the three months up to the end of September. Load factors were 53.6 per cent (passenger) and 66.8 (total revenue), with 15,984 passengers, 338.6 tons of freight and 4.9 tons of mail being carried. DC-3s are used on all routes but the company has expressed its intention of buying Handley Page Heralds.

East-West Airlines was founded in 1947 with headquarters at Tamworth, N.S.W. The company has a network of 2,244 unduplicated route miles and it serves the inland farming area between Sydney and Brisbane, using a small fleet of DC-3s which have replaced the Hudsons formerly used.

A quarter of a million miles were flown in the three months under review, and 13,063 passengers, 201 tons of freight and one ton of mail were carried. The passenger load factor was 62.4 per cent and the overall revenue load factor 58.1 per cent.

MacRobertson-Miller Airlines. During the third quarter of 1955 this organization was still operating as two separate companies, MacRobertson-Miller Aviation and Airlines (W.A.), Ltd.

In that period M.M.A. had 11,161 miles of unduplicated routes, carried 8,055 passengers with a 49.6 per cent passenger load factor, and flew a distance of 464,600 miles. Airlines (W.A.) had 6,069 miles of routes, carried 3,320 passengers with a passenger load factor of 40.6 per cent, and flew 288,900 miles.

The combined routes now stretch from Albany on the Southern coast to Darwin in Northern Territory. The fleet comprises DC-3s, Doves and Ansons.

Woods Airways began operation on the Perth to Rottnest

A D.H. Beaver of Qantas seen at Ioe, New Guinea, where four of these handy Canadian-built aeroplanes are at work.

One of T.A.A.'s Viscounts seen at Sydney on the occasion of the Comet 3's visit to Australia last December.

Super Constellations, such as the one seen in this fine study, form the first-line equipment of Australia's great international operator Qantas.

Butler, one of Australia's most progressive operators, own two Viscounts. The picture shows one of them, "R.M.A. Warral."

Below, one of the New Zealand T.E.A. Solent 4s, which operate one of the world's most romantic air routes: that linking Fiji and Tahiti via Samoa and the Cook Islands.

Island route in 1948. This is still the company's only route and the distance, 26 miles, makes it one of the shortest air routes in the world. An Anson is used to maintain the service, on which 651 passengers were carried in July, August and September last year. The passenger load factor was 59.6 per cent, the number of miles flown 4,100 and the total hours 39.

Connellan Airways began operations in 1939 and have an unduplicated route mileage of 7,838, but they carry fewer passengers than do Woods Airways. The airline is based at Alice Springs and operates on routes ranging from a 32-mile circuit to Mt. Irwin up to the 193 miles flight to Wyndham. The highest number of passengers in the three months was 105 on the Wyndham route, and the total of 243 for all routes produced a passenger load factor of 23.1 per cent.

Qantas Empire Airways, founded in 1920 as Q.A.N.T.A.S., began operations in 1922. In 1934 Qantas Empire Airways was formed by the old Q.A.N.T.A.S. and Imperial Airways.

Q.E.A., which is now completely Australian, has 9,877 miles of domestic routes, mostly in New Guinea and the adjacent area, between Sydney and New Guinea, and between Sydney and Norfolk Island. The company's international routes west to South Africa and northwest to Europe, to the Far East and across the Pacific to the U.S.A. and Canada, add a further 50,157 unduplicated route miles.

Heaviest traffic in that period on international routes was 6,933 passengers on the routes to Europe and 3,746 on the trans-Pacific services. The total number of passengers on international services was 14,259 with a passenger load factor of 64.1 per cent.

The Qantas fleet consists of Super Constellations, DC-4s, DC-3s, Beavers and a Drover. It is expected that an announcement will soon be made on the company's choice of big jets.

New Zealand Air Transport

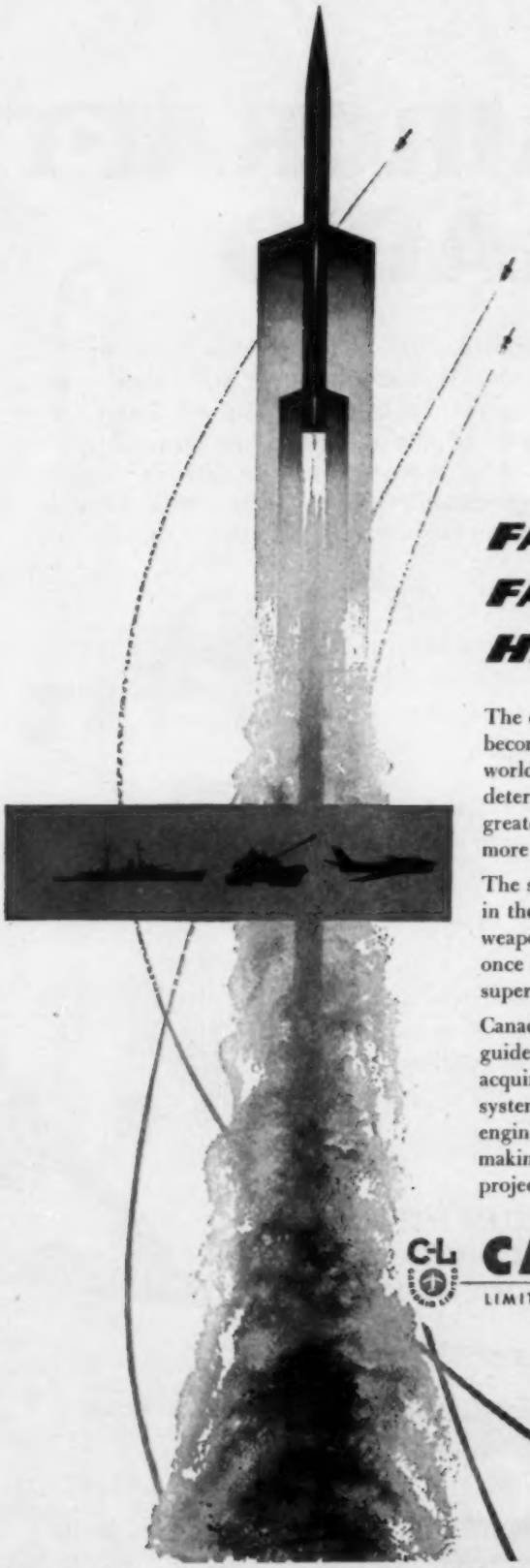
Responsibility for the operation of New Zealand's domestic air services rests with the **New Zealand National Airways Corporation,** which was founded in 1945, operates some 3,000 miles of routes and maintains a route network within and between the North and South Islands. The fleet consists of DC-3s, Herons and Dragon Rapides. Three Viscount V.807s are on order.

Responsible for the operation of services linking New Zealand and Australia is **Tasman Empire Airways,** which was formed in 1940, and which since 1954 has been jointly owned by the New Zealand and Australian Governments. Tasman Empire Airways, more generally known as TEAL, operates DC-6 services between Sydney and Christchurch, Sydney and Auckland, and Melbourne and Christchurch. DC-6s are also used on a twice-weekly service from Auckland to Fiji; a DC-4 links Auckland and Norfolk Island; and Solent services link Fiji, Tonga, Samoa, Cook Islands and Tahiti.

In the three months ended September 30, 1955, TEAL carried 4,733 passengers between Auckland and Sydney, 1,707 between Christchurch and Sydney and 999 between Christchurch and Melbourne. On these three routes 4,162 hours were flown and the passenger load factor averaged 76.7 per cent; on the Auckland - Sydney route it was as high as 78.6 per cent.

Another New Zealand operation is the cargo ferry across Cook Strait, which is operated by **Straits Air Freight Express** on behalf of the New Zealand Government Railways. Bristol 170s are used, and the main operation is between Wellington and Blenheim; no recent traffic figures are available. J. S.

A D.H. Heron 1 of N.Z.N.A.C. seen making its daily crossing of Cook Strait, between North and South Island.



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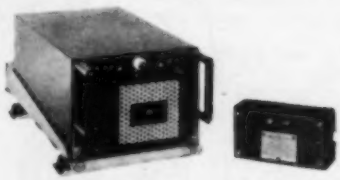
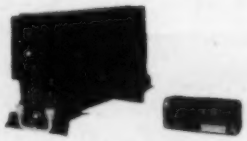


The new Airmite II lightweight VHF Transceiver. 4 channels, weight 15 lb. Range 100 miles. Particularly suitable for light aircraft.



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De Havilland's plant at Bankstown.

The Australian Industry

A REVIEW OF THE ACTIVITIES OF THE MAJOR AIRCRAFT AND ASSOCIATED COMPANIES

COMMONWEALTH AIRCRAFT CORPORATION PTY., LTD.

THE Commonwealth Aircraft Corporation was the first major aircraft manufacturing company to be established in Australia, owing its existence to a conference convened in 1935 by the Commonwealth Government to decide how the country could best provide for a proportion of its own needs of military aircraft. C.A.C., formed the following year by a group of large Australian industrial organizations, was the result; among names now associated with it are mining and metal companies including the Broken Hill Pty. Co. (which is the major shareholder), I.C.I. of Australia and New Zealand, the Orient Steam Navigation Co., and Rolls-Royce, Ltd.

C.A.C.'s main airframe-producing plant is at Fishermen's Bend, outside Melbourne; the engine factory is alongside it, and there is a subsidiary (Government-owned) engine factory at Lidcombe which the Corporation operates as a Government annexe. At Fishermen's Bend in 1938 C.A.C. established its own aluminium foundry, and during the war this produced over 2,200,000 lb of aluminium and magnesium castings, to meet its own requirements and those of the Australian aircraft industry. Another foundry was set up during the war at Highett, Victoria, and by the end of it had taken over the production of magnesium castings from Fishermen's Bend. But subsequently another new foundry was set up at the main factory, and Highett handled work for Merlin production at Lidcombe.

C.A.C. activities are under the control of the manager, Sir Lawrence J. Wackett. The members of the board of directors are L. Darling (chairman); Essington Lewis (chairman of the wartime Aircraft Advisory Committee); K. G. Begg; M. L. Baillieu; J. D. Bates; Sir Sydney Rowell; Sir Lawrence Wackett; and A. G. Brown, who is also secretary.

Aircraft Division

DURING the past year work has proceeded on the production of Avon-Sabres and Winjeels, both projects being approximately two-thirds completed. The present order is for 90 Sabres and it is expected that the R.A.A.F. will place another order, for a new fighter project, in the near future. Sabre production is, of course, by far the most ambitious enterprise yet undertaken by C.A.C.

These Australian Sabres with RA.7s have reached supersonic speeds, their climbing rate is almost twice that of those variants used in Korea, they have more formidable firepower (2×30 mm guns), their ceiling is about 55,000ft and their radius of action exceeds 500 miles, with fuel for 15 minutes combat in addition. Provision is made for carrying air-to-air missiles.

C.A.C. production plans for Sabres have been based on an output of one aircraft a week, including its engine and spares (though by bringing in sub-contractors this could easily be doubled). The tapered skins for the wings are imported, as were about half of the production jigs. The first 20 Avons installed were Rolls-Royce built.

All jet aircraft are now taken to the new Government airfield at Avalon for final assembly and test flying, the airfield at Fishermen's Bend now being used only for piston-engined types.

These, of course, include the Winjeel, the all-Australian basic trainer designed to much the same specification as the Provost. Sixty-two of these, with Wasp Junior engines, have been ordered by the R.A.A.F. and 25 have so far been delivered.

Up to the present time, no Government decision has yet been reached as to what aircraft is to follow the Sabre, though a representative mission visited the U.K., Canada and the U.S. in 1954 to look at different types of aircraft.

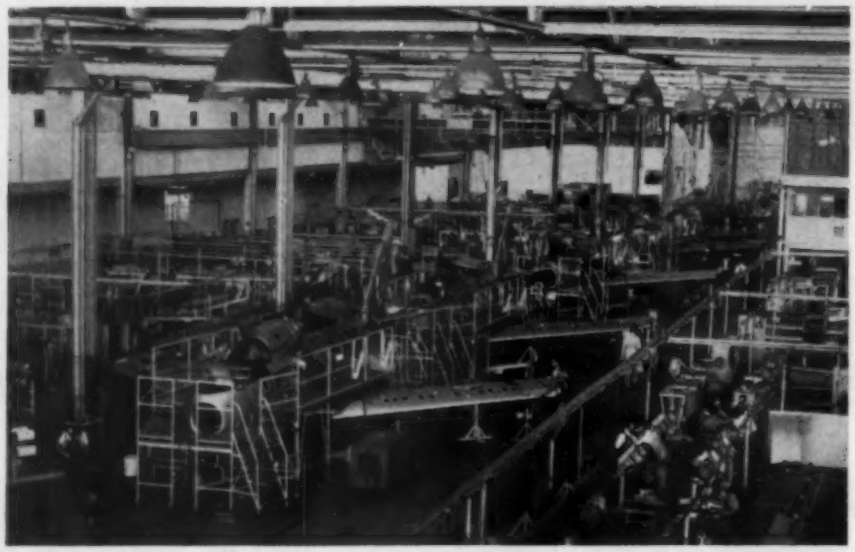
Engine Division

WHEN the Commonwealth Aircraft Corporation was formed in 1936, engine as well as airframe production was started immediately. Work began with the manufacture, under licence, of the Pratt and Whitney Wasp engine and nearly 700 of these were built for the Wirraway trainer. During the war, Twin Wasp production was added, and about 900 of these were built for installation in Boomerang intercepters and Beauforts. The Wasps were manufactured at Fishermen's Bend, the Twin Wasps at the Lidcombe annexe factory.

During post-war years Lidcombe has been mainly occupied with Rolls-Royce Merlin production, and with providing spares and overhauls for Griffon, Centaurus and Twin Wasp R-1830s.

Gas-turbine production began with the Rolls-Royce Nene, ordered for Vampires being built by the Australian de Havilland Company. The Avon followed and, early in 1954, RA.3s were being delivered for Australian-built Canberras; but tooling was already prepared for a change-over to RA.7s. This type, when fitted to Sabres, is known in Australia as the Mk 20; in Canberras it is known as the Mk 109. The Mk 20 has a constant-taper Solar jet-pipe and a 200 h.p. gearbox take-off with spiral bevel drives. All the main components used in Avon production are manufactured by C.A.C., which has four test-beds at Fishermen's Bend, two for piston engines and two for gas turbines. Present work on Avons includes modifications to those already in service.

The Australian Industry...



Commonwealth Aircraft Sabres at the company's Fishermen's Bend factory, outside Melbourne.

DE HAVILLAND AIRCRAFT PTY., LTD.

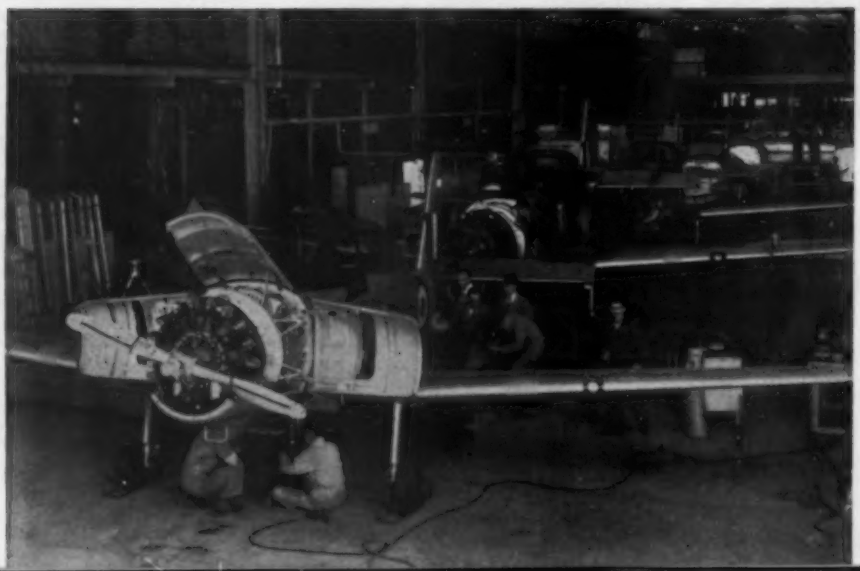
THE decision to make the Mk 33 Vampire Trainer the standard R.A.A.F. advanced training aircraft has been substantiated by an order for a further 68 machines. Construction of fuselages is already under way and it is anticipated that the production line at the Bankstown factory will be in full swing by April next year. Manufacture of Winjeel (primary) trainer wings and centre sections is now nearing completion.

The service department has received a number of Mk 53 Sea Venoms from H.M.A.S. *Melbourne* for familiarization purposes. Modifications and servicing are scheduled to begin shortly. A second large service hangar is under construction and its completion will provide badly-needed floor space for Sea Venom maintenance. Retrospective installation of ejection seats is continuing on Vampires (both fighter and trainer versions). The engine shop is currently installing high-energy ignition systems on all Trainer engines. Service department strength has been increased over recent months, the intention being to increase staff by 100 tradesmen by the time Sea Venom servicing begins. Similar expansion has been the case with the Australian Propeller Division. The de Havilland team at Salisbury, South Australia, has doubled its number over the past 12 months to keep pace with the increasing activities of the Weapons Research Establishment. The Propeller Division at Alexandria, Sydney, has added to its staff by 50 per cent over the last year to cope with the increasing amount of work.

Aircraft sales since last year's report include a Beaver and three Drovers. The Beaver is the second to be bought by the Australian National Antarctic Research Expedition. Two of the Australian-designed and built Drovers were sold and shipped to Fiji Airways, Suva, where they will join the existing Drover fleet, and another Drover was delivered in July to the New South Wales section

Production of Rolls-Royce Avons is the responsibility of the Engine Division of the Commonwealth Aircraft Corporation. Vertical assembly is employed.

Commonwealth Aircraft Corporation: the Winjeel production line. Over 25 of the order for 62 have now been delivered.



Jindivik production at the main Government Aircraft Factory at Fishermen's Bend.

Jindivik front fuselages under construction by Chrysler Australia (Aircraft Division) at Finsbury, South Australia.

of the Royal Flying Doctor Service. This base now operates two Drovers.

Reorganization of the de Havilland organization has amended the Australian Board as follows: President, Sir Geoffrey de Havilland; directors, Major A. Murray-Jones (chairman); L. J. Brain (managing director); D. H. McLachlan (general manager); J. J. Byrne and R. J. Vicars.

GOVERNMENT AIRCRAFT FACTORIES

DURING the last twelve months, the Government Aircraft Factories have continued with production of Canberras for the R.A.A.F., and with Jindivik target aircraft for use at Woomera on joint U.K./Australian projects. Considerable servicing, modification and spares programmes for Lincolns, Canberras and Jindiviks have been undertaken. No new orders were received for production of aircraft, although many enquiries were made and are still in course of negotiation. Design and development work on classified projects was carried on. There are at present 3,236 employees on aircraft work.

The Government Aircraft Factories form part of the Department of Defence Production, which is directed by the Minister, Sir Eric Harrison, K.C.V.O., M.P. Officers of the Department who are concerned with higher policy and with administration of aircraft production generally are the Secretary and permanent head, Mr. H. P. Breen, C.B.E.; the Controller-General of Munitions Supply, Mr. R. H. Doyle; the General Manager, Mr. M. B. Woodfull; and the acting Assistant Secretary (Aircraft Production), Mr. S. C. Weetman. A separate Aircraft Maintenance Branch is headed by Mr. M. A. W. Forestier.

Mr. N. W. Hodgson is the Manager of the Government Aircraft Factories, and other chief executives are Messrs. I. B. Fleming (chief designer); A. P. West (chief engineer); K. D. Johnson (production manager) and J. C. Miles (area manager, Avalon airfield).

The central establishment is at Fishermen's Bend, Melbourne, where administrative, design and planning offices are located, as well as manufacturing and assembly workshops, machine shop, tool room, experimental workshops and laboratories, radio and instrument rooms and central stores. A subsidiary plant at Essendon manufactures some details. Flying operations are now conducted at the Avalon flight field, where final aircraft assembly and aircraft servicing and modification are carried out.

There is a considerable amount of sub-contracting to private industry, the major sub-contractors and their products being: Chrysler Australia, Ltd. (see below); South Australian Railways, Islington, South Australia (wing spars); New South Wales Railways, Chullora, N.S.W. (sundry details and sub-assemblies).

Chrysler Australia, Ltd.

THE Aircraft Division of Chrysler Australia, Ltd., is at Finsbury, a suburb of Adelaide. All equipment in the plant is provided by the Commonwealth Government, for whom Chrysler Australia, Ltd., act as a major sheet metal sub-contractor and as the main press shop for the Australian Government Factories.

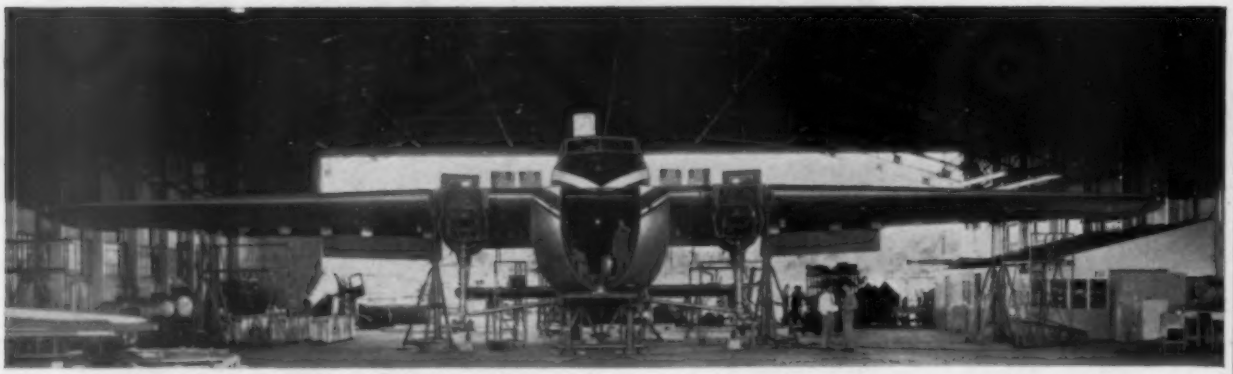
The plant caters for the manufacture of all types of sheet metal details, and for the assembly of minor components. The latter have been built for Canberras, Jindiviks and Winjeels; both details and components have been built for the Australian Lincoln and its subsequent reconnaissance, survey and air-sea rescue versions. The company also produces spares, including main fuel, oil and glycol tanks, spinner rings and other items; for the Department of Defence Production it supplies projectile containers, flares and markers, rocket saddles and similar equipment.

In addition to production work, the necessary tooling is undertaken on the premises in the aircraft tool room. When there is a rush of major projects, the resources of the company's Automotive Tooling Division are available to augment the forces of the Aircraft Division.

A considerable amount of care has been given to the fitting out of the welding department, which is closely controlled by the metallurgist and inspection department to maintain a high quality of workmanship. There is a fully approved research laboratory at the plant which, among other functions, analyses the special processes associated with the manufacture of aircraft components.

The plant operates on a standard costing basis, and a group of methods and planning engineers and time-study observers ensure that a high level of efficiency is maintained. There are at peak 850 employees. The managing director is W. D. Ferguson and the aircraft manager G. V. Hemer.

As the factory at Finsbury is a dispersed unit of the Government Aircraft Factories at Melbourne, future plans for work or expansion depend upon the requirements of the Commonwealth Government.



R.A.A.F. Bristol Freighter undergoing overhaul by Bristol Aviation Services.

COMMONWEALTH AVIATION

The Australian Industry

ANCILLARY COMPANIES

Amalgamated Wireless (Australasia), Ltd.

FOUNDED in 1913, this company manufactures all types of radio and electronics equipment, and is claimed as the largest such manufacturer in the southern hemisphere. In addition to manufacturing equipment under Marconi patents, the company has itself designed and produced a wide range of radio components and installations.

One important aspect of A.W.A.'s activities is servicing. Depots are maintained at all commercial airports for the installation and maintenance of radio equipment and navigational aids; airlines served include B.O.A.C., K.L.M., Pan American and C.P.A.L., in addition to Qantas and all the Australian domestic lines.

Among recent major contracts was that for the manufacture and supply of 98 distance-measuring equipment beacons at airports throughout Australia and New Guinea, together with the manufacture and installation of associated airborne equipment.

Australian Forge and Engineering Pty., Ltd.

THIS company, a subsidiary of High Duty Alloys, Ltd., of Slough, is currently involved in producing forgings for Canberra and Sabre airframes; and for Avon blades. At Lidcombe, drop-forgings in steel, copper alloys and light alloys are manufactured, together with airframe and engine forgings; the plant at Brooklea, Victoria (operated by the National Forge Pty., Ltd.) produces gas-turbine blading in light alloys, aluminium bronze and Nimonic alloys.

The Bristol Aeroplane Company (Australia) Pty., Ltd.

BEING mainly a sales organization and controlling company for Bristol activities in Australia, this company is concerned with aircraft, aero engines and guided missiles. Head office and sales office are respectively located at Bankstown and Melbourne, while the weapons division is at Salisbury. The actual overhaul work performed by Bristols in Australia is the responsibility of a subsidiary company, **Bristol Aviation Services Pty., Ltd.**, of Bankstown, N.S.W.

Bristol Aviation Services' facilities comprise an airframe and electrical overhaul shop at Bankstown Airport, and an engine overhaul section at Short Street, Bankstown, some four miles distant. Aircraft at present being overhauled in the airframe shop include Bristol Freighters, Sycamores and DC-3s; while the engine section handles Hercules, Leonides and Pratt and Whitney engines, Rotol gearboxes and all types of engine accessories.

The general manager and director of both B.A.C. (Australia) and Bristol Aviation Services is G/C. E. A. Whiteley, C.B.E., D.F.C., A.F.R.Ae.S.

Dowty Equipment (Australia) Pty., Ltd.

SALES and service of undercarriages, fuel systems and hydraulic equipment, and the manufacture and distribution of spare parts, continues to be the function of Dowty Equipment (Australia) which is under the technical control of the parent company at Cheltenham.

The facilities in Australia are closely geared to that country's rising industries, and at Bankstown, N.S.W., where there is now 10,000 sq ft of floor space, aircraft stocks and service are readily available and industrial applications are being developed.

The director and general manager is P. F. Handcock.

Dunlop Rubber (Australia), Ltd.

THE aviation division of the Dunlop Australia Company is located in a 35,000 sq ft factory at Bayswater, Victoria; some additional aircraft work, notably the manufacture of tyres, tubes, mouldings and extrusions, is carried out at sections of the main rubber works at Montague and Bayswater. In addition to the manufacture of wheels and brakes for Canberra, Vampire and Winjeel aircraft, the division handles the design and manufacture of pneumatic and hydraulic components, flexible pipes and flexible fuel-tanks. It also carries out repair and overhaul of Dunlop aircraft equipment for the R.A.A.F., R.A.N. and civil operators.

It was in 1952 that the aviation division moved to Bayswater from the main works at Montague. Since then the Bayswater plant has been in production with a range of Dunlop metal aircraft components, some of which have been designed and developed to suit Australian requirements. The factory, which includes a well-equipped machine shop and tool room, also manufactures flexible fuel-tanks under licence from Marston Excelsior; again many of these are new installations designed to meet local needs. The manager of the aviation division, which employs 160 people, is E. F. Faggetter.

Fairey Aviation Company of Australasia Pty., Ltd.

IN addition to its work for the Royal Australian Navy on Fireflies and Sea Furies, Fairey Australasia has now undertaken C.R.O. work on R.A.N. Gannets which reached Australia in June aboard H.M.A.S. *Melbourne*. The company has also started modification and overhaul of Meteors for the R.A.A.F.

Its work in the civil overhaul and conversion field has been continued, mainly on DC-3s. Conversion of a Lodestar for New Zealand agricultural operations, involving a patent rubber hopper with novel design features, is being carried out and an extension of similar work is contemplated.

At Salisbury, South Australia (the company is organized in two independent divisions, the aircraft one being at Bankstown, N.S.W.), the Special Projects Division continues to specialize on rocket test vehicles, instruments and plastic components.

Adastra Hunting Geophysics magnetometer installation in Prince aircraft used for oil and mineral exploration in Australia.

There, 50,000 sq ft of floor space is available; at Bankstown there is 106,000 sq ft.

The managing director of Fairey Australasia is Raymond E. Purves; the general manager of the Special Projects division is Col. R. T. Elvish.

Goodyear Tyre and Rubber Co. (Australia), Ltd.

AT the Goodyear plant, Granville, N.S.W., covering some 17½ acres, aircraft work is combined with commercial tyre production. The company's products for the aviation industry comprise the well-known Goodyear series of aircraft tyres and tubes. Managing director of the Goodyear company in Australia is H. C. Steiner.

Imperial Chemical Industries of Australia and New Zealand, Ltd.

KNOWN generally as ICIANZ, this company manufactures chemical and allied products at factories in Melbourne, Sydney and Adelaide. Among its products of interest to the aircraft industry are polyvinyl chloride polymer; urea formaldehyde moulding-powders, syrups and resins; paint products; trichlorethylene, alkalis and degreasing equipment; leathercloth; and nitric acid.

Polyvinyl chloride production at the Sydney factory is now sufficiently large to meet all Australian demands, including those for compounds, paste polymers and fabricated sheet. Leathercloth output includes both "Vynex" (p.v.c.-coated) and "Fabrex" (nitrocellulose-coated). Paint products are handled by a subsidiary, **BALM Paints Pty., Ltd.**, who manufacture a range equivalent to that of the I.C.I. Paints Division. In addition to these Australian-manufactured items, ICIANZ are a selling organization for a wide range of I.C.I. products.

Kingsford Smith Aviation Service Pty., Ltd.

THIS company, in a 75,000 sq ft factory at Bankstown, includes manufacture, overhaul, repair and supply among its activities. Wooden and metal aircraft components and machined parts are produced, and a complete overhaul and repair service is provided for aircraft up to 19,000 lb and aero engines up to 600 h.p. Overhaul and repair of airframe components, aircraft instruments, magnetos and engine accessories is also carried out.

On the supply side the company acts as agents and distributors for Auster aircraft and for Blackburn Cirrus and Bombardier engines. Engine and airframe spares and aircraft materials are also supplied.

The company's aircraft supply and spares organization at present covers the United Kingdom, India, Pakistan, Burma, Ceylon, the Malay States, Japan and the U.S.A. For the future, additional stores and workshops are being erected to cope with an all-round expansion of activity; and a new division is being formed to exploit agricultural aircraft of all types. In this latter activity special provision is being made for the Auster Agricola.

Managing director and general manager of the company is J. T. Brown.

Lucas-Rotax (Australia) Pty., Ltd.

FIVE years ago Joseph Lucas (Australia), Ltd., and Rotax, Ltd., merged into Lucas-Rotax (Australia), Ltd. Previously the Lucas company at Melbourne, which had undertaken the servicing and overhaul of Rotax electrical equipment from 1937, had continued with this work until 1946 when the Australian Rotax company was formed.

Development since 1951 has led to the establishment of factories at Sydney and at Cheltenham as well as Melbourne, covering a total floor area of some 10,000 sq ft. The firm is approved by the Australian Department of Civil Aviation for the manufacture, repair, overhaul and modification of Lucas fuel systems and control equipment for gas turbines and Rotax electrical accessories and equipment; and, in addition, for the repair, overhaul and modification of Negretti and Zambra flowmeters, electrical accessories and equipment; fuel, vacuum and hydraulic pumps and associated control gear; ignition apparatus and armature windings. The distributing of Lucas, Rotax, Eclipse, Saunders and Negretti and Zambra products is also performed.

Underwing refuelling at Kingsford Smith Airport, Sydney, by Vacuum Oil for Butler Air Transport.

National Instrument Company Pty., Ltd.

A SUBSIDIARY of Australian National Airways, this company is applying its experience in aeronautical instruments towards the development of measuring, controlling and electronic instruments for defence projects in the fields of pilotless aircraft and guided missiles. Its overhaul and repair experience gained with instruments for civil airlines has provided the foundation on which to embark on a development and manufacturing programme of considerable magnitude.

N.I.C.'s experimental section is producing prototype instruments, which have been successfully flight-tested. Development and manufacture of telemetering, electronic, pressure and temperature indicating and recording instruments are being rapidly expanded. The first building (13,000 sq ft) of the plant extensions is devoted to machining, thermometry, assembly, welding and spray painting. It adjoins the existing workshops at Essendon.

The company acts as sales and service agents for a variety of aircraft communication equipment, including the products of Sperry, Plessey and S. B. Pullin. Workshops are also maintained at Sydney, Brisbane, Adelaide and Perth.

Bulk store (29,000 sq ft) of Aviation and Engineering Supplies (Aviation Division) at North Essendon, Melbourne.

Dunlop Rubber (Australia): the Aviation Division plant at Bayswater.

Normalair (Australia) Pty., Ltd.

THIS company's plant at Essendon, which was erected by the National Instrument Corporation, has much better facilities than the previous Normalair factory at Heidelberg. It has been equipped with all necessary test rigs, air blowers, exhausters, etc., to deal with the servicing, maintenance, overhaul and assembly of all Normalair cabin pressurization products.

Also handled are similar products, including refrigeration turbines and air compressors, of AiResearch design, an overhaul agreement having been signed between the Normalair and AiResearch companies; and greater space is available at Essendon for undertaking the repair and overhaul of fuel pumps and other units made by the Self-Priming Pump and Engineering Co. of Slough, with whom Normalair have an overhaul agreement.

The company continues to expand, and recent developments have included the overhaul and servicing of equipment on T.A.A. Viscounts.

Rolls-Royce of Australia Pty., Ltd.

DURING the past twelve months the volume of aero-engine and oil-engine overhaul work passing through the Sydney factory has doubled; it has included both Avons for the R.A.A.F. and Darts. A further 5,000 sq ft has been added to the factory, bringing the total up to 45,000 sq ft, with an additional 10,000 sq ft test-bed facility. Further extensions are to be made.

A considerable increase in technical liaison with the Far East has taken place, especially with regard to Hong Kong and the Philippines. In both these areas, Rolls-Royce engines will soon be operating in the Viscount, and during the early days of the operation the engine overhauls will be coming to the Sydney factory.

Director and general manager of Rolls-Royce of Australia is Peter C. Birch.

Shell Company of Australia, Ltd.

THE Shell Company can this year look back on 55 years' operations in Australia, for it was in 1901 that the Shell Transport and Trading Company began operations there. Four years later the British Imperial Oil Company (a Shell subsidiary) was formed.

The name was changed to Shell Company of Australia in 1927, and Shell Refining (Australia) Pty., Ltd., was formed in 1952.

Present Shell facilities include a refinery at Geelong, near Melbourne; one at Clyde, near Sydney; and over 100 aircraft service points in continental Australia. In addition, a comprehensive network of fuelling points is maintained throughout the Pacific Islands.

S. Smith and Sons (Australia) Pty., Ltd.

THIS company, a subsidiary of the well-known Smiths Aircraft Instruments firm of London, is concerned with the servicing, overhaul and repair of its parent company's products in N.S.W. and Victoria. It has full servicing facilities in Sydney and Melbourne for the overhaul and repair of all civil and military aircraft instruments, automatic pilots and gyro-compass systems. An instrument service and repair facilities are maintained for the R.A.A.F., R.A.N., and civil operators; and test equipment is being developed and manufactured.

At present the company continues to build up know-how on the latest Viscount equipment, particularly on the Smiths S.E.P.2 autopilots currently fitted and operating in Viscounts, and on the latest military version of the same equipment.

The firm is also engaged on a major building programme, which will give 100,000 sq ft of floor space for aviation and kindred commercial instrument projects. Managing director of the company is L. A. Hooke.

Vacuum Oil Company Pty., Ltd.

MANUFACTURE, importation and distribution of aviation gasolines, turbo fuels, lubricants and special products are the responsibility of Vacuum Oil. Australia's first aviation gasoline manufacturing plant, the Standard-Vacuum Refinery at Altona, Victoria, was officially opened in May this year, and is currently producing 70,000 gall daily. **Standard-Vacuum Refining Company (Australia) Pty., Ltd.**, is an affiliate of Vacuum Oil.

The distribution of aviation fuels and lubricants to almost 200 centres throughout Australia and the Pacific Islands is effected by means of flat-top refuelling wagons, or by the underground hydrant refuelling system at those airports where this facility is installed. An extension of these underground hydrant facilities is planned for the future. The company's aviation manager is F. W. Haig.

The plant of Rolls-Royce of Australia at Sydney.

Norway Orders Saab Safirs

for Air Force Training

The Royal Norwegian Air Force ("Flyvåpnet") recently signed a contract with the Saab Aircraft Company for the supply of a substantial number of Saab-91 B-2 Safir trainers.

All initial flying training within the Norwegian Air Force will in the future take place on this Swedish aircraft.

Thanks to its excellent flight characteristics, the Saab Safir can be used as the only piston-engined trainer up to the advanced jet training stage, as is now the case in the Royal Swedish Air Force. However, the Safir is not only in large-scale use as a military trainer, it has also attained a rather unique position as a trainer for airline pilots.

The SAAB SAFIR
is now being used
as a trainer by the following
organizations:
The Royal Swedish Air Force
The Imperial Ethiopian Air Force
Rijksluchtvaartschool of Holland
Deutsche Lufthansa
Sabena Belgian World Airlines
Air France
The Indonesian Government's
Civil Flying Training School

The SAAB SAFIR

SAAB

in service in 17 countries

SVENSKA AEROPLAN AKTIEBOLAGET (Saab Aircraft Company) LINKÖPING · SWEDEN

Then and now

FAIREY RECOMMEND

WAKEFIELD Castrol MOTOR OIL

THE MASTERPIECE IN OILS

HT-2 trainer flying over Penang.

India

HINDUSTAN AIRCRAFT (PRIVATE), LTD.

INDIA'S only aircraft manufacturing organization, Hindustan Aircraft, serves not only the country's domestic needs but also those of many of the airline operators and Air Forces in Asian countries and the Middle East. H.A.L. claims to be the largest aircraft repair, overhaul and manufacturing organization in the East, and possesses its own airport and seaplane landing base.

The company is under the direction of the Ministry of Defence of the Government of India. The activities of the company and the day-to-day administration are controlled by the Board of management under the chairmanship of J. M. Shrinagesh, managing director and general manager; Dr. V. M. Ghatage, chief designer; J. J. M. Dziewonski, production adviser; A. Zampolino, factory manager, and V. G. Kamath, financial manager.

The company's premises at Bangalore, spread over 1,100 acres, and consist of engine and accessories shops, foundry, machine and sheet metal shops, tool room, electroplating shop and a modern test laboratory capable of carrying out physical, mechanical and chemical tests on almost all aircraft materials. The shops are laid out with modern types of equipment and machinery and the test laboratory is provided with an industrial X-ray plant, which is used for the radiographic inspection of castings made at the foundry. Supporting the work of the production units are design, engineering and research departments. The factory has been recognized by the Directorate of Civil Aviation in India, and has the approval of the American C.A.A. for the repair and overhaul of DC-3s, C-47s and Pratt and Whitney engines.

On the manufacturing side the HT-2 trainer, designed and developed by the company, is now in full production. The aircraft has been tested by Indian and foreign pilots, and has been certified as a suitable trainer for basic training for the Indian Air Force, to whom batch deliveries are being made. The Director General of Civil Aviation, also, has placed an initial order. The aircraft is now available for export, and was recently demonstrated to flying clubs and air forces in East Asian countries. H.A.L.-built Vampire fighters continue to be supplied to the Indian Air Force according to programme.

Hindustan Aircraft is an overseas member of the S.B.A.C. and, in addition to possessing the C.A.A. approval for DC-3 work, is also an authorized DC-3 service centre of the Douglas company. H.A.L. is also repairing and servicing agent in India of the de Havilland companies. Aircraft types for which repair and overhaul facilities exist include (in addition to Dakotas) Doves, Harvards, Liberators and Tempests.

The Company's branch factory in Calcutta is continuing to concentrate on repair and overhaul of DC-3s belonging to the Indian Airline Corporation and non-scheduled operators. In addition, this factory will be equipped for the service, repair and overhaul of helicopters.

The total number of personnel employed by the company (including those on railway-coach and bus-body work) is over 11,000; over 9,000 are engaged on aircraft work. In India's second five-year-plan, the factory expects to make considerable progress and will be undertaking the design and manufacture of a jet trainer, advanced jet fighters and aero-engines.

Inspection of the HT-2 by the Prime Minister of Cambodia at Pochentong Airport during the aircraft's East Asian tour.

A typical topdressing refilling operation: Fletcher FU-24 of Wanganui Aerowork.

New Zealand

THE practical application of aviation to agriculture has been—and remains—New Zealand's outstanding contribution to Commonwealth aviation. In particular, the country's developments in the techniques of aerial topdressing—the spreading of fertilizer and grass seed by air on inaccessible high grazing country—have proved their worth in the cultivation of healthy pastureland. In this application, and in the allied farming jobs of crop-spraying and dusting, the expansion of activity since the war has been phenomenal.

To support the work of the hundreds of farm flying operators are many groups of ingenious craftsmen on the aircraft maintenance side—the aerodrome blacksmiths, capable of devising and making specialized equipment for New Zealand's agricultural aircraft as well as coping with routine overhaul and maintenance.

On the manufacturing side, as regards complete aircraft, there is no New Zealand industry. At present about half of a 100-machine series of Fletcher all-metal spray/dust/dressing aircraft from the U.S.A. are in operation, having been assembled from the "knocked-down" condition by New Zealand companies.

The picture may well change over the next twelve months, however, with the appearance in New Zealand of the two new British agricultural aircraft, the Auster Agricola and the Edgar Percival E.P.9. After racing each other neck-and-neck over the past nine months, these types are now both being prepared for New Zealand tours—indeed one is already *en route* at the time of writing—and at least one is probably headed for local manufacture in New Zealand.

The current activities of some of the major companies on the New Zealand aviation scene are reported below; others are listed in the later pages of the Commonwealth directory.

Cable-Price Corporation, Ltd.

THIS company acts as New Zealand and Australian representatives of the Fletcher Aviation Corporation of Rosemead, California, and continues to import Fletcher FU-24 agricultural aircraft in "knocked-down" condition. Assembly of sections and the complete aircraft is the responsibility of Tasman Empire Airways and James Aviation (see under respective headings), and over 40 completed machines have been sold to date.

The de Havilland Aircraft Company of New Zealand, Ltd.

THE major development during the past year has been an extension of the repair work carried out for the R.N.Z.A.F. At Rongotai Aerodrome, maintenance and overhaul of aircraft and engines is performed, the total floorspace being approximately 38,000 sq ft. Facilities include machine shop, plating, test house, wood mill, fitting and welding; and a comprehensive stock of de Havilland and other spares is held. At Palmerston North, a Goblin overhaul shop (de Havilland staffed) is in operation.

Under the presidency of Sir Geoffrey de Havilland, the company employs approximately 50 people. Managing director resident in New Zealand is J. A. Kerr.

James Aviation, Ltd.

A TOTAL of 45 Fletcher FU-24 aircraft have been assembled by James Aviation, which has a further 55 machines to complete during the next 18 months. In addition to final assembly of these aircraft at Rukuhia Aerodrome, Hamilton (the company's main base), the construction of fuselage units is also undertaken.

Workshop space has been increased to a total of 35,000 sq ft, of which 7,000 sq ft is at Rotorua Aerodrome, the firm's second operating base. Helicopter maintenance facilities have been established, and the total staff has been increased to 75.

On the operating side, the company's fleet engaged on agricultural work has been expanded to three Beavers, three Fletchers, three Tiger Moths, and one DC-3. Three Austers are used on forest fire patrol, and three passenger aircraft used on charter work, ambulance and aerial photography. The James company also directs the operation of two helicopters now engaged on aerial work in New Zealand.

Tasman Empire Airways, Ltd.

SITUATED at Mechanics' Bay, Auckland, and Whenuapai Airport, T.E.A.L. provide complete overhaul and maintenance facilities for British and American aircraft and components. These facilities include 54,000 sq ft of hangar space and 80,000 sq ft of workshops. In the Fletcher FU-24 programme, the company assembles the wings and other components.

Other current work includes the overhaul and maintenance of DC-6 aircraft and Solent flying-boats of the company's own fleet, plus Sunderlands, Bristol Freighters and Hastings of the R.N.Z.A.F. Line maintenance of DC-6B aircraft for C.P.A.L. and T.A.I. is carried out and, on the engine side, the overhaul and servicing of Pratt and Whitney engines, Hercules engines, de Havilland and Hamilton Standard airscrews. Servicing of components is also performed.

The scope of the engineering facilities is substantially determined by the airline's geographical situation. Its mail, passenger and cargo-carrying operations take place over a widely flung and lowly populated area, singularly dependent upon air transport but economically not always able to provide attractive operating conditions. The same dependence upon aviation necessitates the maintenance of very highly developed technical facilities, capable of providing full service to the operators of an astonishing range of equipment. General manager and chief executive of T.E.A.L. is G. N. Roberts, C.B.E., A.F.C.

Commonwealth Directory

LISTED in this six-page directory are the majority of the aircraft, ancillary and associated companies of the Commonwealth. In the case of those whose activities have not been reported in this issue's earlier pages, a brief summary of current activities is given; in addition, index references are provided to the major companies already described. The brief directory descriptions and the photographs will give some idea of the amazingly varied work performed by the various companies. The list itself is not an exhaustive one; we believe, however, that it will provide a useful source of reference.

Flight hangar, with T-33 Silver Stars, of Northwest Industries at Edmonton.

CANADA

ABERCORN AERO, LTD., 464 St. John Street, Montreal.—Suppliers of safety equipment, pyrotechnics, aircraft steels and other components to the Services, airlines and industry.

AERO ENGINEERING, LTD., No. 13 Hangar, Municipal Airport, Edmonton, Alberta.—Maintenance, repair and overhaul of aircraft, engines and accessories.

AERO SURVEYS, LTD., International Airport, Vancouver, B.C.—Topographic mapping, aerial surveying and magnetometer surveying. Aero Surveys is a jointly owned subsidiary of Fairey Aviation's Air Survey Group of England, and Fairchild Aerial Surveys, Inc., of the U.S.A.

AEROMAGNETIC SURVEYS, LTD., 1450 O'Connor Drive, Toronto 16.—See p. 310.

AEROMOTIVE ENGINEERING PRODUCTS, 5257 Queen Mary Road, Montreal 29.—Engineering design and sales for suppliers of temperature measurement and control equipment, electronic equipment, aircraft hardware, and hydraulic restrictors and valves.

AEROQUIP (CANADA), LTD., 287 Bridgeland Avenue, Toronto 15.—Subsidiary of Aeroquip Corporation of Jackson, Michigan, possessing 30,000 sq ft of office and manufacturing space and maintaining sales representation in major Canadian cities. Manufactures flexible hose lines, self-sealing couplings and re-usable fittings. Canadian sales representative for Marman Products Co., Inc.

AIRCRAFT APPLIANCES AND EQUIPMENT, LTD., 71 Kipling Avenue South, Toronto 18.—Distributors and overhaul contractors for Jack and Heintz rotomotive equipment; distributors for Hartman Electrical Manufacturing relays. Manufacture of electrical test equipment; repair and overhaul contractors to the R.C.A.F.

AIRCRAFT INDUSTRIES OF CANADA, LTD., Municipal Airport, St. Johns, Quebec.—See p. 308.

ALLIED ENTERPRISES, LTD., 655 Montée de Liesse, St. Laurent, Quebec.—Manufacture of tools and sheet-metal parts; spot and gas welding; heat treatment.

ALLOY METAL SALES, LTD., 181 Fleet Street East, Toronto 2.—Sale and distribution of nickel and nickel alloys, stainless steels and aluminium, together with miscellaneous fittings in these materials.

ALUMINIUM COMPANY OF CANADA, LTD., 1700 Sun Life Building, Montreal.—See p. 308.

ALUMINIUM FOUNDRY AND PATTERN WORKS, LTD., 1345 Miron Street, Ville St. Laurent, Montreal 9.—Aluminium and bronze founders, a large proportion of whose current production is for the aircraft industry.

AMERICAN CHEMICAL PAINT CO., 2224 Walker Road, Windsor, Ontario.—Subsidiary of the American firm, specializing in surface-treatment chemicals. Processes include "alodine" protective coating for light alloys.

ARO EQUIPMENT OF CANADA, LTD., Box 515, Toronto 15.—Canadian representatives of the Aro Equipment Corporation of Bryan, Ohio. Aircraft oxygen components and accessories. Associated also with Ampatco Industries in design, development and production of electronic computers, autopilots and test equipment.

ATLAS ASBESTOS CO., LTD., 5600 Hochelaga Street, Montreal.—Subsidiary of Turner Newall group, producing Ferodo asbestos material.

ATLAS STEELS, LTD., Welland, Ontario.—Suppliers of aircraft specification steels of all types (including Canadian, British and American military specification steels, stainless and heat-resisting alloys) in bar, wire, sheet, strip, plate and special forgings.

Commonwealth Directory . . .

AVIATION DEVELOPMENTS (CANADA), LTD., 2709 Yonge Street, Toronto.—Sale and Supply of specialized fastenings (Huck bolts and blind rivets, Chobert blind rivets and sealing pins, Pip Quick release-pins, Avdel sheet grippers, Avlock blind nuts), Narmco metal-to-metal adhesives and structural laminates.

AVIATION ELECTRIC, LTD., 200 Laurentian Boulevard, Montreal 9.—See p. 308.

AVIONICS LIMITED, Box 200, Niagara-on-the-Lake, Ontario.—Designers and manufacturers of electronic, mechanical and communication equipment for aircraft and industrial use.

AVIQUIPO OF CANADA, LTD., 636 St. Paul Street West, Montreal.—Canadian branch of the New York Aviquipo organization; suppliers of aircraft hardware, electrical equipment, flight and engine instruments and materials.

AVRO AIRCRAFT, LTD., P.O. Box 4004, Terminal A, Toronto.—See p. 300.

BABB CO. (CANADA), LTD., Municipal Airport, St. Johns, P.Q.—Suppliers of parts for Harvard, Canso, Grumman, Beechcraft and Lodestar aircraft, and for R-985 and R-1830 engines. Manufacturing rights held for Canso PBY-5A aircraft. Subsidiary of Babb Co., Inc., U.S.A.; affiliated with Aircraft Industries of Canada Limited, St. Johns, Quebec.

BANCROFT INDUSTRIES, LTD., 851 Mill Street, Montreal.—Sales and service of aircraft hardware, engine and flight instruments.

THE WALLACE BARNES CO., LTD., 274 Sherman Avenue North, Hamilton, Ontario.—Manufacturers of flat and coil springs and stampings for aircraft engine repairs, fuel pumps, landing gear, instruments and fuselage units.

BATA ENGINEERING, Batawa, Ontario.—Manufacture of CF-100 undercarriage components and airframe components, CF-105 prototype parts, CS2F-1 components, and aircraft tooling for machined components. Total employees, 142, floorspace 45,000 sq ft.

B.B. CHEMICAL COMPANY OF CANADA, LTD., Box 1447, Place d'Armes, Montreal.—Manufacture of industrial adhesives for aircraft use.

G. S. BLAKESLEE AND CO., LTD., 18 Cranfield Road, Toronto 16.—Solvent vapour degreasers for aircraft-component production and overhaul processes.

BRISTOL AERO ENGINES, LTD., 10210 Pie IX Boulevard, Montreal North 12, Quebec.—See p. 302.

BRISTOL AERO ENGINES (WESTERN), LTD., International Airport, Vancouver, B.C.—See p. 302.

BRISTOL AEROPLANE COMPANY OF CANADA (1956), LTD., 223 International Aviation Building, Montreal 3.—See p. 302.

BRISTOL AIRCRAFT (WESTERN), LTD., Stevenson Field, Winnipeg, Manitoba.—See p. 302.

BRITISH AMERICAN OIL CO., LTD., 800 Bay Street, Toronto.—Manufacture, marketing and distribution of aviation gasolines and lubricants to commercial operators and the R.C.A.F.

THE BRITISH GENERAL ELECTRIC CO. (CANADIAN), LTD., 1510 Drummond Street, Montreal 25.—Canadian sales organization for the G.E.C. of England.

BRUNSWICK BALKE COLLENDAR CO. OF CANADA, LTD., 40 Hanna Avenue, Toronto.—Manufacture of reinforced plastics, radomes, antenna housings, fairings, ducts and structural parts.

BURNDY CANADA, LTD., 381 Greenwood Avenue, Toronto 8.—Design and manufacture of electrical connectors.

CANADA FOUNDRIES AND FORGINGS, LTD., Brockville, Ontario.—Manufacture of forgings for aircraft use.

CANADAIR, LTD., Box 6087, Montreal.—See p. 303.

CANADIAN AERO SERVICE, LTD., 348 Queen Street, Ottawa, Ontario.—Affiliated with Spartan Air Services, Ltd., and Aerophysics of Canada, Ltd. Specialists in photogrammetric mapping, electronic geodetic survey, relief models and maps, airborne geophysical exploration and interpretation. Offices in Montreal, Ottawa, Toronto, Edmonton, Calgary and London. Total employees, 150.

CANADIAN AVIATION ELECTRONICS, LTD., P.O. Box 630, Station O, Ville St. Laurent, Quebec.—See p. 308.

CANADIAN CAR AND FOUNDRY CO., LTD., (Headquarters) 621 Craig Street West, Montreal 3; (Plant), Box 67, Fort William, Ontario.—See p. 302.

CANADIAN ELECTRIC RESISTORS, LTD., 16 Curity Avenue, Toronto 16.—Vitreous-enamel-coated wire-wound resistors and rheostats; rotary regulating transformers.

CANADIAN FLIGHT EQUIPMENT, LTD., Cobourg, Ontario.—Manufacture, repair and overhaul of Martin-Baker ejection seats used in CF-100; subcontract manufacture of aircraft detail parts and components.

CANADIAN MARCONI COMPANY, (Head Office) 2442 Trenton Avenue, Montreal 8; (Aviation Department) 3rd Floor, 970 McEachran Avenue, Montreal 8.—See p. 309.

CANADIAN PRATT AND WHITNEY AIRCRAFT CO., LTD., Longueuil, Montreal 23.—See p. 304.

CANADIAN STEEL IMPROVEMENT, LTD., 41 Horner Avenue, Etobicoke, Ontario.—See p. 301.

CANADIAN S.K.F. CO., LTD., 2201 Eglington Avenue East, Scarborough, Ontario.—Manufacture of precision ball and roller bearings, as used by Rolls-Royce Canada, Orenda Engines and Canadian Pratt and Whitney.

CANNON ELECTRIC CANADA, LTD., 160 Bartley Drive, Toronto 16.—Wholly owned subsidiary of Cannon Electric Co., of Los Angeles; manufacturers of electrical connectors for aircraft. Future plans for manufacture of coaxial connectors for aircraft electronics instruments.

CARRIERE AND MACFEETERS, LTD., 51 Front Street East, Toronto.—Overhaul and repair of aircraft electrical accessories; pumps, valves, controls, airport electrical equipment; coil and armature winding. Contractors to Dept. of Defence Production.

CARRUTH LABORATORIES, 94 Haddington Avenue, Toronto 10.—Canadian sales office of Carruth Laboratories, Inc., of Dallas, Texas, manufacturers of aircraft instrument parts.

CHATCO STEEL PRODUCTS, LTD., Louise Street, Tilbury, Ontario.—The aircraft side of this organization hold a subcontract for the complete manufacture and assembly of centre-sections and fins and rudders for the CF-100.

T. C. CHOWN, LTD., 1440 St. Catherine Street West, Montreal 25.—Canadian representatives for Aerotherm aircraft seats and Aerotec aircraft controls.

COLLINS RADIO COMPANY OF CANADA, LTD., 11 Bermondsey Road Toronto 16.—See p. 309.

COMPUTING DEVICES OF CANADA, LTD., P.O. Box 508, Ottawa 4.—See p. 309.

COSSOR (CANADA), LTD., 301 Windsor Street, Halifax, N.S.—See p. 309.

CURTISS-REID MANUFACTURING CO., LTD., Box 310, Station O, Montreal 9.—Overhaul and repair of aircraft components, production of welded sub-assemblies.

DECCA NAVIGATOR (CANADA), LTD., 272 Dalesford Road, Toronto 14.—See p. 309.

DECCA RADAR (CANADA), LTD., 272 Dalesford Road, Toronto 14.—See p. 309.

THE DE HAVILLAND AIRCRAFT OF CANADA, LTD., Postal Station L., Toronto.—See p. 305.

DEXION (CANADA), LTD., Box 114, Weston, Ontario.—Manufacture of Dexion slotted angles, the general-purpose aid to aircraft production.

DOMINION FASTENERS, LTD., P.O. Box 492, Hamilton, Ontario.—Manufacture of the range of fasteners designed by Tinnerman Products, Inc., including self-retaining speed nuts, instrument mounting guns and self-locking hose clamps.

DOMINION MAGNESIUM, LTD., 320 Bay Street, Toronto.—Producers of magnesium and magnesium-alloy ingots, billets, slabs and extrusions.

DOWTY EQUIPMENT OF CANADA, LTD., Ajax, Ontario.—See p. 310.

DUNLOP CANADA, LTD., 870 Queen Street East, Toronto 8.—Sales and service of Dunlop tyres and aviation equipment; manufacture of aircraft tyres and aviation products.

ELECTRO-HYDRAULICS (CANADA), LTD., P.O. Box 14, Station D, Toronto.—Canadian representatives of the Electro-Hydraulics Company of Warrington, England. Landing gear, hydraulic systems, electro-hydraulics and powered flight controls.

ELECTRONIC LABORATORIES OF CANADA, LTD., 281 North Howard Avenue, North Burnaby, Vancouver, B.C.—Consultant electronic engineers to the armed Services and aircraft industry. Manufacturers of low-frequency and high-frequency loop antenna.

ELLIOTT BROTHERS, P.O. Box 124, Sioux Lookout, Ontario.—Manufacturers of aircraft ski equipment.

ENAMEL AND HEATING PRODUCTS, LTD., Aircraft Division, Amherst, N.S.—See p. 310.

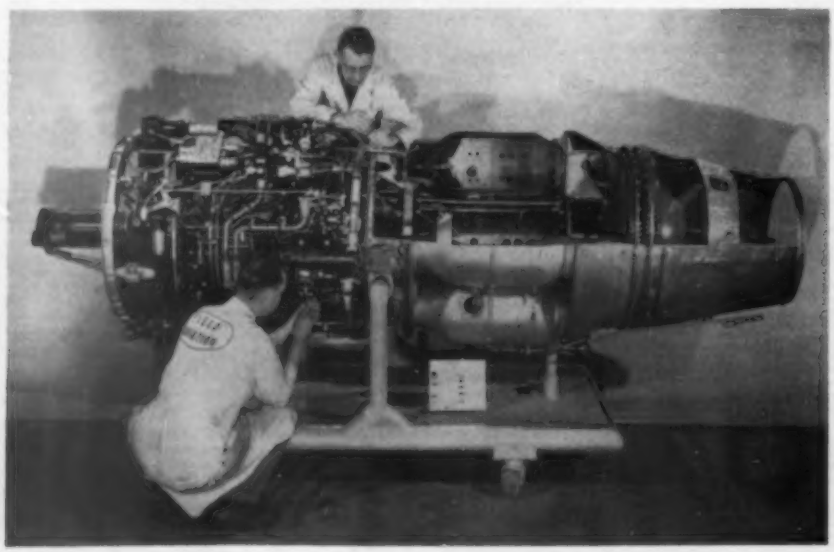
ENHEAT AIRCRAFT (Aircraft Division of Enamel & Heating Products, Ltd.) Amherst, N.S.—See p. 310.

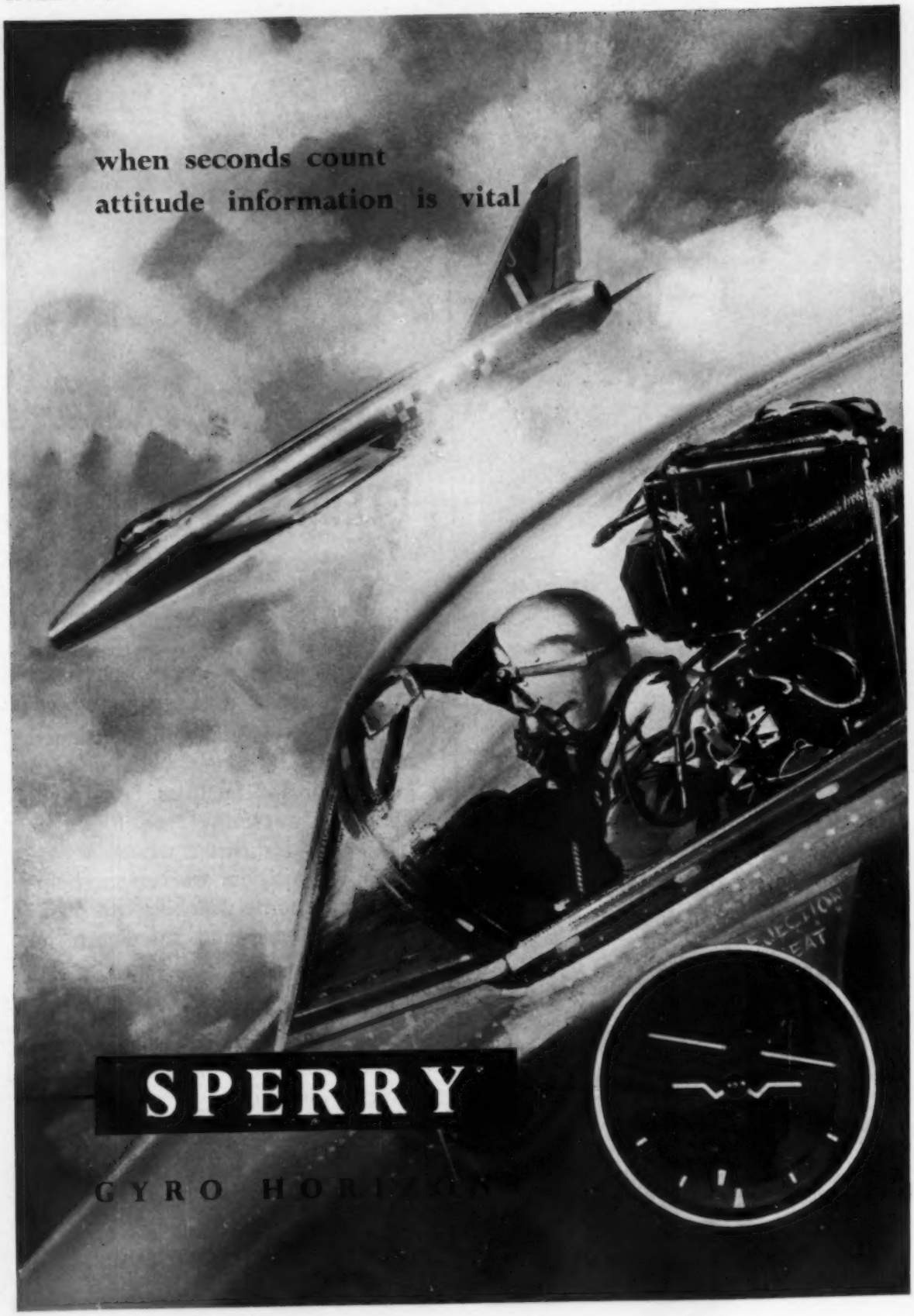
ENTERPRISE AGENCIES, LTD., 5301 Western Avenue, Montreal 28.—Canadian agents for U.S. manufacturers of infinitely variable speed transmissions, industrial pumps, hydraulic and electronic equipment for ground and aircraft use, flexible and metallic tubing.

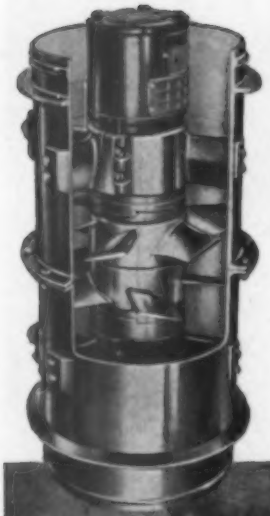
FAIREY AVIATION COMPANY OF CANADA, LTD., P.O. Box 69, Dartmouth, N.S.—See p. 306.

FEDERAL CINE-PHOTO PRODUCTS, LTD., 134 Queen Street, Ottawa.—Canadian agents for Cine-

Sectioned Orenda 14 by Field Aviation, Oshawa.




when seconds count
attitude information is vital
SPERRY
GYRO HORIZON



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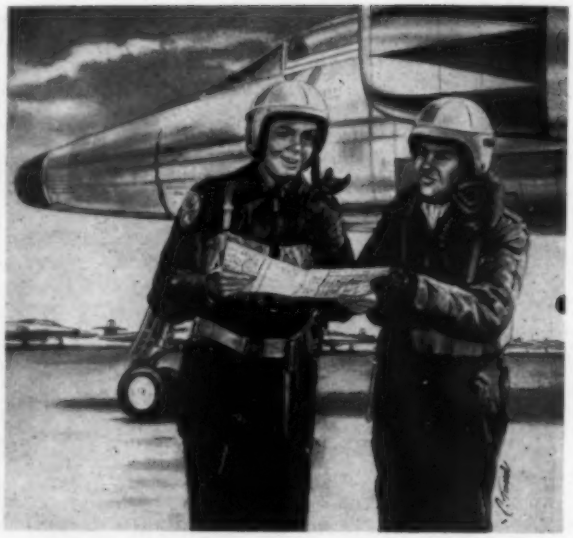

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matograph Export, Ltd., of London, England, who are distributors for Vinten flight-test cinematograph equipment.

FERRANTI ELECTRIC, LTD., Industry Street, Mount Dennis, Toronto 15.—Production of electrical gyroscopic aircraft instruments.

FIBERGLAS CANADA, LTD., 50 St. Clair Avenue West, Toronto.—Manufacturers of Fiberglas products, insulation, sleevings, cloths, moulded parts and reinforcing materials.

FIELD AVIATION COMPANY, LTD.—Municipal Airport, Oshawa, Ontario.—See p. 310.

FLEET MANUFACTURING, LTD., P.O. Box 300, Fort Erie, Ontario.—See p. 306.

FOUND BROS. AVIATION CO., LTD., Toronto Airport, Malton, Ontario.—Manufacturers of temperature bulbs and aircraft ground-handling equipment. Supply of reconditioned aircraft parts.

GARRETT MANUFACTURING CORP. OF CANADA, LTD., 4 Racine Road, Rexdale, Ontario.—Wholly owned subsidiary of the Garrett Corp. of Los Angeles. Sales, service, overhaul and manufacture of miscellaneous aircraft components, including air-conditioning systems, engine oil cooling systems, heat-exchanger systems, electrical actuator systems, cabin pressure-regulating systems and gas turbines. Representation of AiResearch and Air Cruisers divisions of parent Garrett Corp. Facilities being expanded to handle larger variety of components.

GENAIRE, LTD., Municipal Airport, St. Catharines, Ontario.—In its St. Catharines plant of 26,000 sq ft floor area, 100 men are employed on repair and overhaul of airframe components and accessories, and the manufacture and overhaul of training aids. An additional 44,000 sq ft hangar at Malton Airport, Toronto, provides hangarage, supplies and maintenance for executive operators and itinerant aircraft.

GODFREY ENGINEERING CO., LTD., 480 Metropolitan Boulevard, Lachine, Montreal 32.—See p. 310.

B.F. GOODRICH CANADA, LTD., 251 King Street West, Kitchener, Ontario.—Subsidiary of B.F. Goodrich Company of Troy, Ohio. Manufacturers of aircraft tyres and tubes, de-icers, Avtrim hose and aircraft accessories. Size-range of aircraft tubeless tyres is to be expanded.

GOODYEAR TIRE AND RUBBER CO. OF CANADA, LTD., New Toronto, Ontario.—Subsidiary of the parent organization of Akron, Ohio; manufacturers of tyres, tubes, wheels, brakes, de-icing systems and hosing. Head office and factory at New Toronto; factories at Bowmanville, Ontario, St. Hyacinthe, Quebec and Quebec City.

HAYES STEEL PRODUCTS, LTD., Merritton, Ontario.—Manufacture of steel and aluminium-alloy forgings for landing gear and other components; machining of aircraft parts.

HEROUX MACHINE PARTS, LTD., 340 Thurber, Longueuil, Quebec.—Manufacturers of hydraulic controls, extruded hinges, spars, three-dimensional milling machines; overhaul of hydraulic equipment. Development of new hydraulic valves and three-dimensional machines is planned. Plant of 24,000 sq ft, with 100 employees.

HUNTING ASSOCIATES, LTD., 1450 O'Connor Drive, Toronto.—See p. 310.

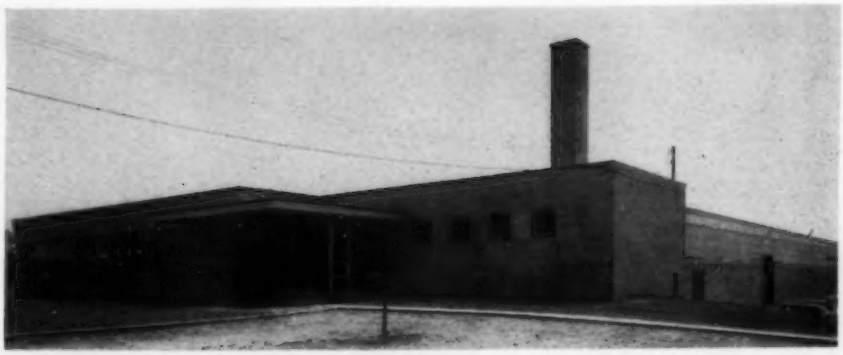
IMPERIAL OIL, LTD., 56 Church Street, Toronto 1.—Suppliers of aviation gasolines, jet fuels, lubricants, greases and special products. Continuous service to Canadian Aviation since the Dominion's first official air mail test flight, from Toronto to Ottawa, in 1918.

INAERCO., LTD., Box 750, Perth, Ontario.—Manufacture of high and low pressure hose and accessories, engine and airframe parts and other high-precision components.

INDUSTRIAL ELECTRONICS OF CANADA, LTD., Rexdale Boulevard at Kipling Avenue, Toronto.—Manufacture of air data computors, principally for aircraft fire-control systems. Have worked on missile computor projects for de Havilland Canada and fire-control equipment for Canadair and Avro Aircraft; expect to participate in guided-weapon production programme for Canadian Services, with possibility of assembling and manufacturing servo-motor components. Other products; accelerometers, transducers, power supplies, dry-plate and mercury-arc rectifiers, master data computors. New premises occupied August 1; increase in engineering, production and administrative facilities planned.

INTERNATIONAL NICKEL CO. OF CANADA, LTD., 25 King Street West, Toronto 1.—See p. 311.

IRVIN AIR CHUTE, LTD., 479 Central Avenue, Fort Erie, Ontario.—Manufacturers of parachutes, drogues, air stabilizers and pressure-breathing flying suits. Current products include pneumatic anti-"g" suits.



The Aeroquip (Canada) Ltd. plant at Toronto.

Computing Devices' new home at Bells Corners, Ottawa.

The Montreal factory of the Walter Kidde Company.

IRVINGTON VARNISH AND INSULATOR CO. OF CANADA, LTD., 1390 Burlington Street East, Hamilton, Ontario.—Subsidiary of Minnesota Mining and Mfg. of St. Paul, Minnesota. Manufacturers of flexible insulating materials, insulating varnishes and extruded plastic tubing.

JARRY HYDRAULICS, 4384 St. Denis, Montreal 18.—See p. 311.

KENTING AVIATION, LTD., 1450 O'Connor Drive, Toronto, and Municipal Airport, Oshawa.—See p. 311.

WALTER KIDDE AND CO. OF CANADA, LTD., 5500 Royalmount Avenue, Montreal 9.—Manufacture, repair and overhaul of pneumatic equipment, engine fire-detection and fire-extinguishing systems, Fibreglas high-pressure containers, life jacket and dinghy inflation gear, and miscellaneous special devices. Area of 70,000 sq ft recently acquired, adjacent to new plant, for future manufacturing of compressed gas cylinders and other components presently imported from parent company, Walter Kidde and Co., Inc., of Belleville, N.J.

J. W. LAWRENCE RADIATORS, LTD., 607 Chatham Street, Montreal.—Servicing, repair and overhaul of oil coolers and coolant radiators for British and American engines, together with associated control valves, thermostats, etc. Rolls-Royce approved contractors for craft heat exchange equipment.

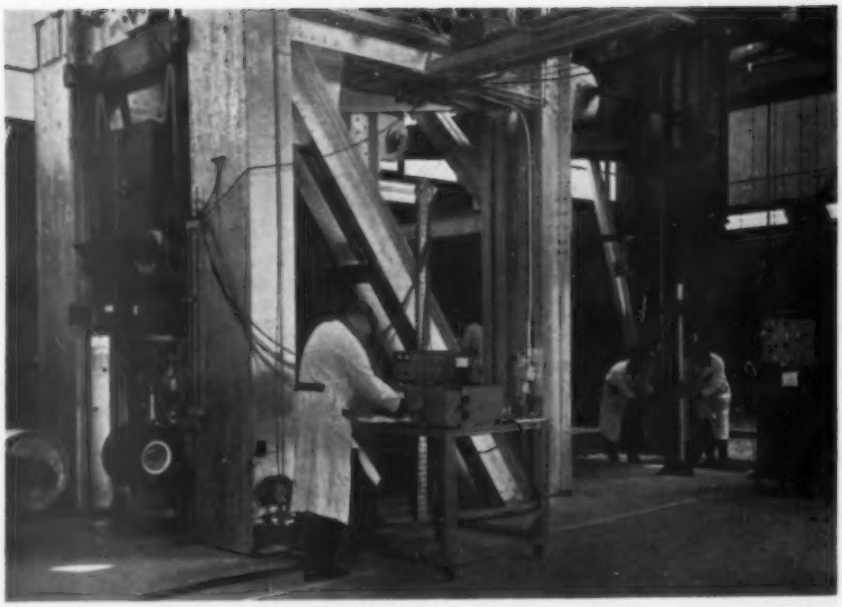
LEAVENS BROS., LTD., 3220 Dufferin Street, Toronto.—Manufacture and distribution of aircraft hardware, parts and accessories, e.g. welded and machined components for Chipmunk, Beaver, Otter; fabric covering and finishing of Chipmunk components. Overhaul and repair of airframes, floats, skis, engines and accessories, instruments, radio and propellers. Fabrication of reinforced-plastics parts; in addition to wide-spread flying activities, e.g. scheduled mail and passenger flights, charters, dusting, spraying, aerial photography, advertising and mineral survey. New engine overhaul shop is planned.

LIGHT ALLOYS, LTD., Haley, Ontario.—Engine and aircraft component castings in aluminium and magnesium base alloys for Canadian aircraft industry. Working floorspace, 80,000 sq ft; sand castings comprising floor moulding, core assemblies, machine moulding and CO process. Approximately 200 employees.

LUCAS-ROTAX, LTD., Box 115, Station H, Toronto.—See p. 312.

MCQUAY-NORRIS MANUFACTURING CO. OF CANADA, LTD., Ray and Goddard Avenues, Toronto 15.—Manufacture of components for piston engines and turbojets.

MINNEAPOLIS - HONEYWELL REGULATOR CO., LTD., Vanderhoof Avenue, Leaside, Toronto 17.—Sales, service, assembly, overhaul and repair of Minneapolis-Honeywell aircraft automatic-control devices, gyros, automatic bombing systems, jet engine controls and miscellaneous precision instruments.



Part of the dual drop-test rig at the Dowty Plant at Ajax, showing the guillotine type (on the left) and the main parallelogram type (right), with Consolidated and Sanborne electronic recording equipment.

Commonwealth Directory . . .

NOORDUYN NORSEMAN AIRCRAFT, LTD., P.O. Box 5, Station O, Montreal 9.—See p. 312.

NORMALAIR (CANADA), LTD., 1425 The Queensway, Etobicoke, Toronto.—See p. 312.

NORTHWEST INDUSTRIES, LTD., P.O. Box 517, Edmonton, Alberta.—See p. 312.

ORENDA ENGINES, LTD., P.O. Box 4015, Terminal A, Toronto.—See p. 300.

PANTEX MANUFACTURING (CANADA), LTD., 3556 St. Lawrence Boulevard, Montreal 18.—Manufacture of precision components for aircraft hydraulic systems, in particular relief valves. Subsidiary of Pantex Manufacturing Corp.

PHOENIX ENGINEERED PRODUCTS, LTD., 750 Lawrence Avenue West, Toronto 10.—See p. 313.

THE PHOTOGRAPHIC SURVEY CORPORATION, LTD., 1450 O'Connor Drive, Toronto.—See p. 311.

PHOTOGRAPHIC SURVEYS (QUEBEC), LTD., 420 Lagauchetiere Street West, Montreal.—See p. 311.

PRECISION RUBBER PRODUCTS (CANADA), LTD., Ste. Therese, Quebec; (sales office) 5302 Dundas Street West, Toronto 18.—Canadian subsidiary of Precision Rubber Products Corp., Dayton, Ohio. Production of precision "O" rings and Dyna-seals.

PRENCO PROGRESS AND ENGINEERING CORP., LTD., 72-74 Stafford Street, Toronto.—See p. 313.

P.S.C. APPLIED RESEARCH, LTD., 1500 O'Connor Drive, Toronto 16.—See p. 311.

PYE CANADA, LTD., 60 Front Street West, Toronto.—See p. 313.

R.F.D. (CANADA), LTD., 464 St. John Street, Montreal.—See p. 313.

RENFREW AIRCRAFT AND ENGINEERING CO., LTD., 660 St. Catherine Street West, Montreal.—See p. 313.

A. V. ROE CANADA, LTD., Box 430, Terminal A, Toronto.—See p. 300.

ROLLS-ROYCE OF CANADA, LTD., P.O. Box 10, Dorval Station, Quebec.—See p. 307.

E. ROY INDUSTRIES, LTD., L'Assomption, Quebec.—Manufacture of tools, jigs, fixtures, aircraft and engine components; assembly of aircraft units.

SANDERSON AIRCRAFT, LTD., Malton, Ontario. — Servicing of scheduled airline aircraft at Malton, overhaul and repair of aircraft, engines and radio. Manufacture of Beaver components for de Havilland.

SHELL OIL COMPANY OF CANADA, LTD., 25 Adelaide Street East, Toronto.—Forms part of Shell's global network of aviation service, with products sold at major airports across Canada. The company supplies aviation gasolines, turbine fuels and engine oils, in addition to special aviation fluids, greases and compounds.

SIMMONDS AEROCESSORIES OF CANADA, LTD., 5800 Monkland Avenue, Montreal 28. — See p. 313.

SMITH AND STONE, LTD., 50 St. Clair Avenue West, Toronto.—Electrical wiring devices; compression-moulded, injection-moulded, extruded and fabricated plastic components; low-pressure laminated, aluminized and silicone parts.

SPARTAN AIR SERVICES, LTD., 74 Sparks Street, Ottawa.—Affiliated with Canadian Aero Service, Ltd., and Aerophysics of Canada, Ltd. Specialists in aerial photography, air photo interpretation, mosaics, airborne geophysical exploration, helicopter charter for survey, transportation, maintenance and instruction. Main operations base at Uplands Airport, sub-base at Edmonton Airport, branch offices at Montreal, Toronto, Edmonton, Calgary, London. Aircraft fleet has increased to 46, including 18 helicopters.

SPERRY GYROSCOPE COMPANY OF CANADA, LTD., 6011 Cote de Liesse Road, Montreal.—See p. 313.

STANDARD AERO ENGINE, LTD., P.O. Box 764, Winnipeg.—See p. 313.

STANDARD TELEPHONES AND CABLES MANUFACTURING CO. (CANADA), LTD., 9600 St. Lawrence Boulevard, Montreal 12.—Manufacture and installation of radio aids to air navigation, microwave systems and radar apparatus, in addition to a wide range of telephone, television, radio equipment, cables, etc.

SURVEY AIRCRAFT, LTD., International Airport, Vancouver, B.C.—Affiliate of Aero Surveys, Ltd. Repair and overhaul of aircraft and aircraft components; electroplating.

TECALEMIT (CANADA), LTD., Rexdale Boulevard, Rexdale, Ontario.—Subsidiary of the Tecalemit Company of Plymouth. Manufacture and supply of specialized equipment and oil-filters.

TIMKEN ROLLER BEARING SERVICE & SALES, LTD., 43 Edward Street, Toronto.—Canadian representative of Timken Roller Bearing Co. of Canton, Ohio.

UNITED AIRCRAFT PRODUCTS (CANADA), LTD., 5257 Queen Mary Road, Montreal.—Wholly owned subsidiary of United Aircraft Products, Inc., of Dayton, Ohio, where all design engineering is at present conducted. Sales engineering of fuel, oil, air and hydraulic systems, primarily heat exchangers and cold-weather oil systems.

VICTORY TOOL AND MACHINE CO., LTD., 250 Rose de Lima Street, Montreal.—Manufacture of precision parts for airframes and engines.

WEATHERHEAD CO. OF CANADA, LTD., 109 Inkerman Street, St. Thomas, Ontario.—Manufacture of hydraulic-system components (fittings, hose assemblies and couplings) and other precision aircraft and engine parts.

WILLIAMSON CO. OF CANADA, LTD., Postal Station L, Toronto.—Sales and service agents for aerial survey, reconnaissance and gun cameras and other photogrammetric equipment produced by the Williamson Manufacturing Co. of England.

YORK GEARS, LTD., 825 Caledonia Road, Toronto 10.—Manufacturers of sub-assemblies and precision parts for Avro and Orenda; extensive production of a wide range of precision gears.

AUSTRALIA

G. ADAMS AND SON, 180 Gardeners Road, Mascot, N.S.W.—Aircraft components; manufacture and repair of wooden airscrews.

W. O. AND B. ADAMS, 144 Pelham Street, Carlton, Victoria.—Manufacturers of cast phosphor-bronze bar for the aircraft industry.

ADASTRA AIRWAYS PTY., LTD., 41-43 Vickers Avenue, Mascot, N.S.W.—Specialists in aerial survey photography and contour mapping. **Large hangar at Mascot** now nearing completion; additional drawing office space planned.

ADASTRA HUNTING GEOPHYSICS PTY., LTD., 41-43 Vickers Road, Mascot, N.S.W.—Associate company to Adastra Airways. Airborne magnetometer and scintillometer survey operations and mapping. Geophysical airborne surveys under contract in S. Australia, Queensland and Tasmania. Further contracts resulting in increase of staff and aircraft.

ADVANX TYRE AND RUBBER CO. PTY., LTD., Neild Avenue, Rushcutters Bay, N.S.W.—Specialists in rubber components for aircraft.

AERIAL AGRICULTURE PTY., LTD., Bankstown Airport, N.S.W.—Airframe and component repairs and overhauls; distributors of spares.

AERO SERVICE PTY., LTD., Maylands Airfield, W.A.—Manufacturers of metal and wooden aircraft components; overhaul and repair of airframes, engines and components. Specialists in aerial agricultural work.

AERONAUTICAL SUPPLY CO. PTY., LTD., Matthews Avenue, Airport West, Victoria.—Manufacture of electrical connectors (in association with Cannon Electric), and air/sea rescue and survival equipment and targets (in association with R.F.D.). New plant completed at Victoria; branch offices at Mascot and Parafield. Agents for Alvis, Hunting Percival and Hymatic.

AMALGAMATED WIRELESS (AUSTRALASIA), LTD., 47 York Street, Sydney, N.S.W.—See p. 320.

ASSOCIATED POWER SEALS PTY., LTD., 200 Bay Street, Port Melbourne, Victoria.—Specialists in gaskets, oil seals, etc., for the aircraft industry.

AUSTRAL BRONZE CO. PTY., LTD., O'Riordan Street, Alexandria, N.S.W., and Williamson Road, Maribyrnong, Victoria. — Manufacturers of aluminium bronze, bronze bars, sheet copper, and extrusions in these materials.

AUSTRALIAN ALUMINIUM COMPANY PTY., LTD., P.O. Box 12, Granville, N.S.W.—Suppliers of semi-fabricated aluminium to Australian industry. Rolling, extrusion and forging of aluminium carried out at Granville works, with 700 employees. Expansion of rolling and extrusion facilities is planned.

AUSTRALIAN FORGE AND ENGINEERING, LTD., Parramatta Road, Lidcombe, N.S.W.—See p. 320.

AVIATION AND ENGINEERING SUPPLIES PTY., LTD., 134 Ferrars Street, South Melbourne, Victoria.—Suppliers and stockists of aircraft, engine and equipment spares (64,000 sq ft at Melbourne, Essendon and Mascot); manufacturers and overhaul of aircraft parts (14,000 sq ft at Melbourne). Representatives of Blackburn and General Aircraft, Handley Page, Scottish Aviation. Photograph, p. 321.

AVIATION MANUFACTURING CO. PTY., LTD., Auburn, Victoria. —Manufacturers and distributors of B.G. sparking plugs and fittings.

BALM PAINTS PTY., LTD., P.O. Box 21, Concord, N.S.W.—One of the largest manufacturers and distributors of paint products in Australasia. Current aircraft products include the complete finishing processes for the Jindivik pilotless aircraft. See also p. 321.

BENDIX-TECNICO PTY., LTD., 61-69 James Street, Rockdale, N.S.W.—Main function of this company is to procure or manufacture Bendix Aviation Corporation products for Australia. In a new 45,000 sq ft factory at Rockdale, manufacture of aircraft generating, starting and control equipment and electronic apparatus is carried out, together with servicing of aircraft electrical equipment. Distributors for B.T-H. magnetos, Exide batteries, Champion plugs and Teddington controls. Total employees, 200.

LEWIS BERGER AND SONS (AUSTRALIA) PTY., LTD., Rhodes, Sydney, N.S.W. Associates of the English Berger company, manufacturers of aircraft dopes and finishes.

BRICO (AUSTRALIA) PTY., LTD., 47 Mallett Street, Camperdown, N.S.W.—Production of engine components including aircraft piston rings. Foundry in operation for production of specialised castings (including centrifugal castings).

THE BRISTOL AEROPLANE CO. (AUSTRALIA) PTY., LTD., (Head office) P.O. Box 4, Bankstown, N.S.W.; (Sales office) 414 Collins Street, Melbourne, Victoria; (Weapons division) P.O. Box 112, Salisbury, S.A.—See p. 320.

BRISTOL AVIATION SERVICES PTY., LTD., P.O. Box 4, Bankstown, N.S.W.—See p. 320.

BRITISH AUSTRALIAN LEAD MANUFACTURERS PTY., LTD., Cabarita Road, Concord, N.S.W.—Manufacturers of aircraft finishes.

BRITISH TUBE MILLS (AUSTRALIA) PTY., LTD., Churchill Road, Kilburn, S.A. — Manufacturers of aircraft steel tubing, tubular components, gas cylinders, etc.; repair and overhaul of tubular structures.

BRUNTSONS BRIGHT STEEL PTY., LTD., Booker Street, Spotswood, Victoria.—Steel bar to aircraft specifications.

CABLE MAKERS AUSTRALIA PTY., LTD., Liverpool, N.S.W.—Manufacturers of all types of rubber, thermo, plastic and varnished cambric insulated cables, moulded rubber and plastic components; also of plastic foam materials.

CASCO CHEMICALS PTY., LTD., Wellington Road, South Granville, N.S.W.—Manufacturers of glues, synthetic resins and other adhesives for aircraft and general purposes.

CHRYSLER (AUSTRALIA), LTD., Aircraft Division, Finsbury, S.A.—See p. 319.

COMMONWEALTH AIRCRAFT CORPORATION, P.O. Box 779H, Elizabeth Street, Melbourne.—See p. 317.

COMMONWEALTH STEEL CO., LTD., Waratah, N.S.W.—Manufacturers of steel to aircraft specifications.

G. E. CRANE AND SONS PTY., LTD., 33 Pitt Street, Sydney, N.S.W.—Manufacturers of sheet aluminium and alloys to aircraft specifications.

DE HAVILLAND AIRCRAFT PTY., LTD., P.O. Box 30, Bankstown, N.S.W.—See p. 318.

DOWTY EQUIPMENT (AUSTRALIA) PTY., LTD., Bankstown, N.S.W.—See p. 320.

DUNLOP RUBBER AUSTRALIA, LTD., Aviation Division, Mountain Highway, Bayswater, Victoria.—See p. 320.

EXIDE BATTERIES OF AUSTRALIA, LTD., 44 Bridge Street, Sydney, N.S.W.—Supply of Exide aircraft batteries; provision of battery parts; overhaul and repair.

FAIREY AVIATION COMPANY OF AUSTRALASIA PTY., LTD., (Main plant) P.O. Box 41, Bankstown, N.S.W.; (Special projects division) P.O. Box 85, Salisbury, S.A. See p. 320.

FAWCETT AVIATION PTY., LTD., Hangar 276, Bankstown Airport, N.S.W.—Airframe and engine overhaul and repair; overhaul of components; electrical installations and overhauls; manufacture of machined parts.

FIBRAK (AUSTRALIA) PTY., Sydney, N.S.W.—Subsidiary of Oldham and Sons, Ltd., of Manchester; battery manufacturers.

SIR GEORGE GODFREY AND PARTNERS (AUSTRALIA) PTY., LTD., 539 Bourke Street, Melbourne C.1.—Subsidiary company of the English Godfrey organization, responsible for sales, servicing, maintenance and testing of the parent firm's cabin pressure, air-conditioning and refrigeration equipment.

GOODYEAR TYRE AND RUBBER CO. (AUSTRALIA), LTD., Granville, N.S.W.—See p. 321.

GOVERNMENT AIRCRAFT FACTORIES; (Headquarters), Dept. of Defence Production, 339 Swanston Street, Melbourne C.1; (Plant), Fishermen's Bend, Port Melbourne, Victoria; (Flight-test section), Avalon, Victoria.—See p. 319.

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NATIONAL INSTRUMENT COMPANY PTY., LTD., Melbourne Airport, Essendon, Victoria. —See p. 321.

NETTLEFOLDS PTY., LTD., Ballarat Road, Sunshine, Victoria.—Manufacturers of aircraft rivets, screws, split pins, nuts (including Aerotight nuts).

NORMALAIR (AUSTRALIA) PTY., LTD., Essendon, Victoria.—See p. 322.

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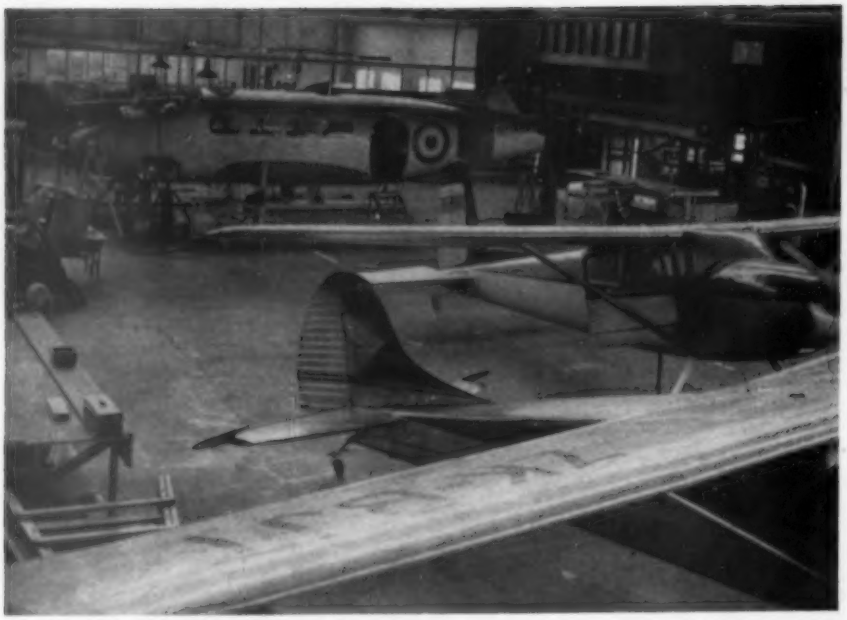

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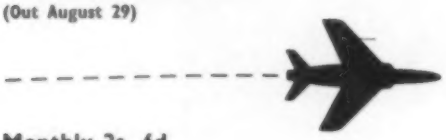

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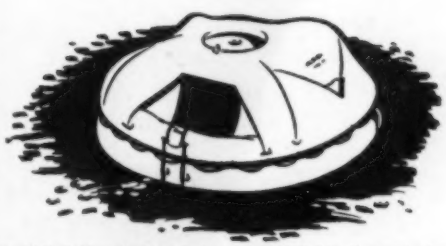

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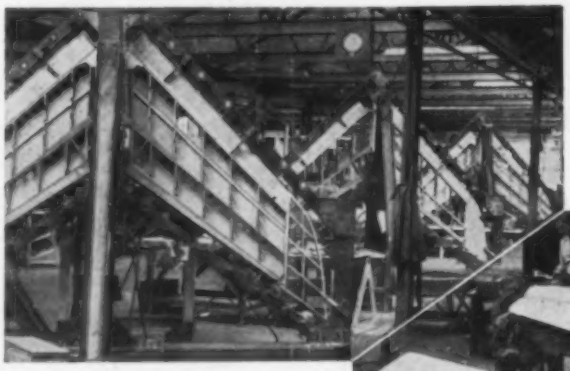

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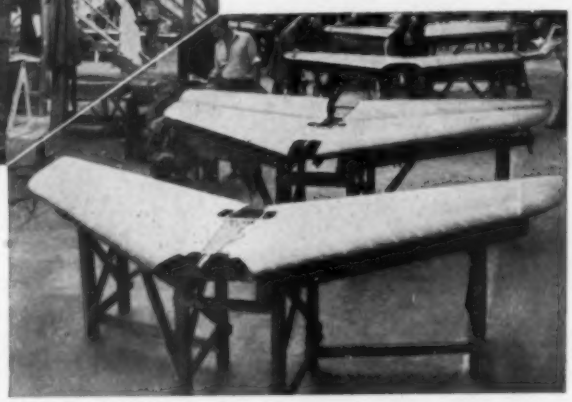

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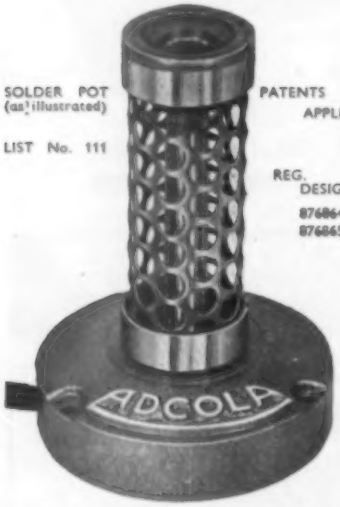

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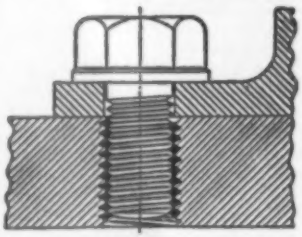

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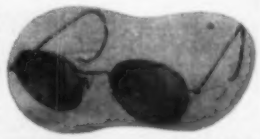

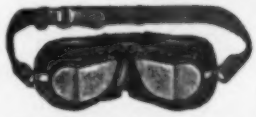

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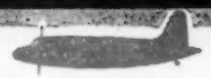

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THIS application will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to this application must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3, Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [5637

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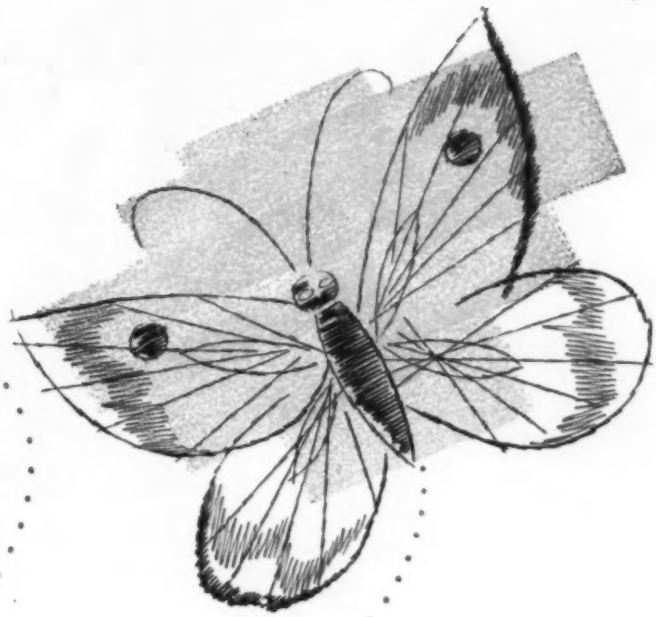

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